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RESPONSE OF BROILER BIRDS FED RICE HUSK IN PLACE OF WHEAT OFFALS: PHASE SUPPLEMENTATION OF XYLANASE ENZYME

Ojebiyi, O.O., Nabu M.A. Shittu M.D. and Bakare A. M.
Department of Animal Nutrition and Biotechnology, Ladoke Akintola University of Technology,
P.M.B. 4000, Ogbomoso,Oyo State,Nigeria.
Corresponding author email: segunojebiyi@gmail.com

Abstract

The experiment was conducted to investigate the effect of dietary replacement of wheat offal with rice husk with or without enzyme supplementation on nutrient digestibility of broiler chickens at different phases. Two hundred and eighty-eight day old Marshall strain of broiler chicks were used for the experiment. The birds were randomly divided into 8 groups of 3 replicates of 12 birds each to make a total of 36 birds per treatment in a complete randomized design experiment (CRD). The diets were formulated as follows: Diet 1 was the control with wheat offal, Diet 2 – plus rice husk without enzyme supplementation), Diet 3 – Diet 2 + AG enzyme (1ml/litre of water) for eight weeks, Diet 4 – Diet 2 + Maxigrain (0.1 grammes/kilogramme of feed) for eight weeks, Diet 5 – Diet 2 + AG enzyme (1ml per litre of water) for the first four weeks of the experiment, Diet 6 – Diet 2 + Maxigrain (0.1 grammes/kilogramme of feed) for the first four weeks of the experiment, Diet 7 – Diet 2 + AG enzyme (1ml per litre of water) for the last four weeks of the experiment, Diet 8 – Diet 2 + Maxigrain (0.1 grammes/kilogramme of feed) for the last four weeks of the experiment. The experiment lasted for 8 weeks. Enzyme supplementation significantly ($P<0.05$) affected nutrient digestibility. The dry matter digestibility (DMD) had similar value in diets 7 and 8, but higher in diet 7 and lower in diet 2. Also, the crude protein digestibility (CPD) had similar value in diets 1-8, but higher in diet 1 and lower in diet 2. Hence, it was concluded that rice husk could be used as alternative to wheat offal in formulating broiler diet at 10% in the starter phase and 16% in the finisher phase.

Keywords: Wheat offal, Rice husk, nutrient digestibility, Maxigrain enzyme, Ag-enzyme

Introduction

Rice husks, the major part of rice milling waste contains about 3.66 kcal/g energy, 5.25% crude protein and as high as 33.1% fibre. The use of rice husk as an ingredient in animal feeds, especially ruminants and poultry has been well documented (Dafwang and Shwarmen, 1996; Awesu *et al.*, 2002). However, its use in the feeding of monogastric animals is limited by its high fibre content. In broilers, high fibre tends to limit the amount of intake of the available energy by the birds and also results to the secretion of excessive nutrients (Kung *et al.*, 2000). Agbede *et al.*, (2002) had shown that high fibre and lignin contents of rice husk are capable of reducing nutrient utilization and also precipitate metabolic dysfunction when digested by non-ruminants. Considering the fact that poultry cannot fully utilize high fibre diets because of the lack of the digestive framework that can elaborately digest large amount of fibre, it becomes necessary to incorporate exogenous enzymes into their diets in order to enhance the breakdown of the non-starch polysaccharides (NSPs) present in fibre.

Addition of enzyme to monogastric animal feed reduces viscosity of ingesta in the intestine and shows a marked improvement on the various morphological effects of feeding fibrous materials (Allen *et al.*, 1997). Strategies for ensuring adequate nutrition of animals must be based on optimizing overall agricultural and livestock productivity from available resources, improving existing technologies and integrating technology that employs multipurpose crops and animals, and recycling of crop residues and by –products as feeding stuffs for animals (Njwe, 1990).

The aim of this study is to replace of wheat offals with rice husk with or without enzyme supplementation on nutrient digestibility of broiler chickens.

Materials and Methods

Experimental site: The experiment was carried out at the Poultry Unit of Teaching and Research farm, Ladoke Akintola University of Technology, Ogbomoso Oyo State.

Formulation of experimental diets: Eight (8) experimental diets was formulated for the study at the starter phase (1-4 weeks) and finisher phase (5-8 weeks) as indicated below:

Diet 1- control with wheat offal for 8 eights, Diet 2- control without wheat offal but rice husk for eight week, Diet 3- Diet 2 + AG enzyme for eight weeks, Diet 4 – Diet 2 + maxigrain for eight weeks, Diet 5 – Diet 2 + AG enzyme for the first four weeks of the experiment, Diet 6 – Diet 2 + maxigrain for the first four weeks of the experiment, Diet 7 – Diet 2 + AG enzyme for the

last four weeks of the experiment, Diet 8 – Diet 2 + maxigrain for the last four weeks of the experiment.

Experimental Animals and Management: Two hundred and eighty-eight (288) day old Marshall stains of broiler chicken was used for the experiment. Birds were randomly allocated to eight dietary treatments of three replicates each. Each replicate had twelve (12) birds to make a total of thirty-six birds per treatment in complete randomized design (CRD) experiment. The birds were offered adequate feed and water on daily basis throughout the experiment which lasted for eight (8) weeks.

Data Collection

Digestibility study: At the end of the experiment, three birds were taken from each treatment and transferred to metabolic cages for digestibility study. The birds were acclimatized for two (2) days after which faecal samples were collected for five (5) days, the wet as well as the dry weight of faeces were taken. The corresponding feed intake for five days was also recorded. The samples from each treatment for five days were bulked together and sub sample were taken for proximate analysis.

Laboratory analysis: The experiment diets as well as feacal samples were analyzed for proximate composition by method of (AOAC, 2005).

Data analysis: All data collected were subjected to one way analysis of variance using the GLM of SAS (2003). Means Duncan's Multiple Range Test of the same package was used for comparing the means.

Results and Discussion

The nutrient digestibility is presented in Table 1. The digestibility coefficient for all the components were significantly ($P<0.05$) different in all the dietary treatments except the live weight. The dry matter ranged ($P<0.05$) from 69.87 in diet 2 to 84.59 in diet 7. The crude protein also ranged ($P<0.05$) from 81.50 in diet 1 to 87.50 in diet 2. The crude fibre varies from 60.00 in diet 2 to 67.50 in diet 6 while the crude ash varies from 56.00 in diet 2 to 64.00 in diet 5.

The inclusion of enzyme increase the dry matter digestibility of rice husk based diet. The conventional wisdom would suggest that exogenous xylanase will have a better efficacy in the diet with high concentration of non starch polysaccharides. Nonetheless, the structure of the non starch polysaccharides from different ingredients and weather soluble or insoluble, may determine the response to specific enzymes targeting dietary fibre (Choct 1997). This agrees with the report of Piano *et al.*, (2002) and Li *et al.*, (2002) who reported that digestibility of most nutrients were higher in replacing brown rice with corn.

Rice husk based diet with enzyme supplementation in diet 8 exhibit an increased of crude fat digestibility when compared with other treatments. Danicke *et al.*, (1999) reported that the digestibility of crude fat is greatly reduced in the presence of soluble pentosans, this study suggested that crude fat digestibility was affected by rice husk based diet without enzyme supplemenatation in diet 2. Crude fat digestibility was increased in diet 8 due to addition of enzyme which was not evident in diet 2.

Conclusion

This study shows that it could be concluded that rice husk could be used as an alternative to wheat offal in formulating broiler diet at 10% in the starter phase and 16% in the finisher phase.

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Table 1: Effects of dietary treatments on Nutrient Digestibility of broiler chickens

Parameters	Diets								SEM
	1	2	3	4	5	6	7	8	
Live weight (g)	2439.33	2477.33	2532.67	2669.33	2619.00	2464.00	2514.33	2518.67	33.91
Dry matter (%)	82.38^{a}	64.52^{d}	73.97^{c}	78.13^{b}	70.99^{c}	69.87^{d}	84.59^{a}	84.02^{a}	0.81
Crude Protein (%)	87.50^{a}	81.50^{c}	86.50^{a}	82.50^{bc}	84.50^{b}	83.00^{b}	83.50^{b}	82.00^{c}	0.37
Crude fat (%)	93.50	92.50	93.50	93.00	93.50	93.00	93.00	94.00	0.08
Crude fibre (%)	64.00^{b}	60.00^{c}	63.50^{a}	67.50^{a}	65.50^{ab}	67.50^{a}	65.50^{ab}	63.50^{ab}	0.18
Crude ash (%)	63.00^{a}	56.00^{b}	58.50^{a}	56.50^{b}	64.00^{a}	57.50^{b}	61.50^{a}	57.00^{b}	0.52

^{abcd} Means with similar subscripts along the same row are significantly ($P<0.05$) different

Table 2: Gross composition of Experimental diets (Starter phase)

Ingredients	Diets							
	1	2	3	4	5	6	7	8
Rice husk	--	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Wheat offal	10.00	--	--	--	--	--	--	--
¶Fixed ingredients	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
Cocci guard	+	+	+	+	+	+	+	+
AG enzyme	--	--	+	--	+	--	+	--
Maxigrain	--	--	--	+	--	+	--	+
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Analyzed composition								
Crude protein (%)	2 2.48	22.67	22.67	22.39	22.67	22.67	21.67	22.39
Crude fibre (%)	4.64	6.79	6.79	6.79	6.79	6.79	6.79	6.79
Ash	7.13	7.21	7.21	7.16	7.21	7.16	7.21	7.46
*ME (Kcal/kg)	2859.80	2812.80	2812.80	2812.80	2812.80	2812.80	2812.80	2812.80
Cost/kg of feed (₦)	119.00	115.76	115.76	115.76	115.76	115.76	115.76	115.76

¶Fixed ingredients: maize 45,soyabean meal 32, Corn bran 4.50, Bone meal 3.00, Palm kernel cake 2.00, Fish meal (72%) 2.50, Methionine 0.25, Lysine 0.25, Premix 0.25, Salt 0.25

*ME = Metabolizable energy (Calculated)

Table 3: Gross composition of Experimental diets (Finisher phase)

Ingredients	Diets							
	1	2	3	4	5	6	7	8
Rice husk	--	16.00	16.00	16.00	16.00	16.00	16.00	16.00
Wheat offal	16.00	--	--	--	--	--	--	--
¶Fixed ingredients	84.00	84.00	84.00	84.00	84.00	84.00	84.00	84.00
Cocci guard	+	+	+	+	+	+	+	+
AG enzyme	--	--	+	--	+	--	+	--
Maxigrain	--	--	--	+	--	+	--	+
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Analyzed composition								
Crude protein (%)	18.87	19.28	19.28	18.79	19.28	18.79	19.28	18.79
Crude fibre (%)	4.15	7.59	7.59	7.59	7.59	7.59	7.59	7.59
Ash	5.97	6.08	6.08	5.89	6.08	5.89	6.08	5.89
*ME (Kcal/kg)	2808.46	2733.30	2733.30	2733.30	2733.30	2733.30	2733.30	2733.30
Cost/kg of feed (₦)	91.50	85.00	85.00	85.00	85.00	85.00	85.00	85.00

¶Fixed ingredients: Maize 49.30, soybean meal 23, Corn bran 2.00, Bone meal 3.70, Palm kernel cake 2.00, Fish meal (72%) 3.00, Methionine 0.25, Lysine 0.25, Premix 0.25, Salt 0.25, ME =*Metabolizable energy (Calculated)