EFFECT OF FERMENTED RICE HUSK ON GROWTH PERFORMANCE AND HAEMATOLOGY OF BROILER CHICKENS

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SUMMARY

A study was conducted to evaluate effect of rumen filtrate fermentation of rice husk meal on growth performance and haematological indices of broiler chickens. One hundred and fifty (150) birds were used to carry out the research work. The rumen filtrate treated rice husk meals were included at 0, 5, 10, 15 and 20% to form diets 1, 2, 3, 4, and 5, respectively. The birds were randomly allocated to the five treatments groups, each group had three replicates and there were ten birds per replicate. The experimental design used was complete randomized design (CRD).The proximate composition of fermented rice husk meal showed increase in crude protein content (8.87 %). The growth rate was influenced ($p<0.05$) by the dietary treatments, with broiler chickens on dietary treatments containing 15% and 20% having higher ($p<0.05$) growth rate than those on 5% and 10%. Data on White blood cells, Lymphocyte, Red blood cell, Haemoglobin, Packed cell volume, and Mean cell haemoglobin concentration were measured. All haematological parameters measured were not affected ($P>0.05$) by dietary treatments except the Mean cell haemoglobin concentration. All the haematological parameters were within normal levels and were not detrimental to the health of the chickens. It is concluded that inclusion of rumen filtrate fermentation rice husk meal in the diets of broiler chickens up to 20% gave improved nutrient content and weight gain and had no adverse effect on the health of the birds.

INTRODUCTION

A number of measures in recent times had been taken in developing countries to alleviate the problem of low availability of animal protein for human consumption which had been hampered by high cost of production (Damisa, 2008). Maize is a major ingredient in the poultry diets. Its availability and price are influenced by competition between man, industry and livestock. Hence, it makes economic sense to find cheap alternatives for maize in poultry diets. Most of the alternative feed ingredients for maize contain Non-Starch Polysaccharide (NSP) (Dalibord, 2006). However, the broilers digestive enzyme profiles are not designed to digest NSP thereby limiting the broilers ability to utilize high fibre feedstuffs. This intolerable high fibre content causes digestive inefficiency of the gastro-intestinal tract thereby reducing the effect of digestive enzymes and absorption of nutrients (Jozefiak *et al.*, 2004). Efforts to extract more nutrients from feedstuffs (both conventional and non-conventional) have been a focus for research for decades (Peter and Hoffman, 2002).

Fermentation of rice husk waste using rumen filtrate as inoculum can increase the crude protein content and decrease the crude fiber content (Wizna *et al.*, 2008). The bacteria in the rumen liquor act on the fiber part of the husk by cellulase enzyme and act on the phytate-phosphorus by phytase enzyme which ultimately lowers fiber contents and makes more of the organic phosphorus available to the bird.

Blood plays a vital role in the transportation of nutrients, metabolic waste products and gases around the body (Zhou *et al.*, 1999). Moreover, blood serves as a medium of assessing clinical and nutritional health status of animals .The aim of present work is to study the effect of

fermented rice husk meal on growth performance and haematological indices of broiler chickens.

MATERIALS AND METHODS

Rumen liquor preparation

Five hundred ml of ruminal fluid was collected from rumen compartments of slaughtered cattle in sterile collection bottles at the Minna Modern Abattoir. The ruminal fluid was filtered through a muslin cloth in order to remove the larger feed particles .Solid material was discarded while the fluid (liquor) part of the content was transferred to clean bottle for laboratory culturing at Microbiology laboratory of the Federal University of Technology, Minna Bosso Campus. The whole process took approximately 10 minutes. The procedure of Muhannad, (2010) was adopted in this experiment.

Feed and experimental design

The feed experiment was conducted in the Teaching and Research Farm of Federal University of Technology, Bosso Campus, Minna, Niger State, Nigeria. One hundred and fifty 150 day-old unsexed broiler chicks were purchased from Chi farm Ibadan and they were subjected to 56 days of experimental period. On arrival, birds were weighed and randomly allocated to one of the five treatments in a complete randomized design (CRD). Each treatment was replicated three times with ten (10) birds per replicate**.**

The rice husk was purchased from rice millers in Gidan kwano village, Minna. The feed ingredients (maize, groundnut cake, palm oil, salt) used for the experiment were purchased from Kure Ultra-modern market, Minna, while lysine, methionine, vitamin mineral premix, fish meal, limestone, vaccines and drugs were purchased at Step by Step Shop, along new market road, Minna, Niger State.

Five isocaloric and isonitrogenous (23% CP and 3000 kcal/kg ME) experimental diets were formulated. The formulated diets were designated T1, T2, T3, T4 and T5, respectively, which represented different inclusions levels of 0, 5, 10, 15, and 20% of rumen filtrate fermented rice husk, respectively. The feed ingredients in the formulated diet consist of maize grain, groundnut cake, fermented rice husk, fish meal, lysine, methionine, bone meal, salt, palm oil and vitamins/minerals premix to give 23% crude protein and metabolizable energy of 3000 ME (Kcal/kg) needed for growth in broiler chicken. The daily feed intake was gotten by subtracting the left over from the amount of feed offered the previous days. The daily weight gain of each bird was determined by dividing the total weight gain by total number of days. The feed conversion ratio (FCR) was calculated as dry matter intake per unit weight gain.

Sample collection and preparation

Two birds were randomly selected from each replicate on weight equalization basis and blood samples were collected from each of them through a wing vein. The blood sample was collected into a labeled EDTA specimen bottle for hematological indices determination.

Packed cell volume (PCV), Red blood cell (RBC), and White blood cell (WBC) were quantitatively determined using improved Neubar's haemacytometer after dilution, while haemoglobin level was analyzed using cyanomethaemoglobin method as described by Dacie and Lewis (1991). The standard ratios of the mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated according to the procedure of Jain (1986).

Statistical analysis

All data generated during the study on various parameters were subjected to analysis of variance in a completely randomized design using the (SAS, 2000) package. Duncan's Multiple

Range Test was used to separate the means where statistically significant differences occurred at $P<0.05$.

RESULTS AND DISCUSSION

Table 1 shows the proximate composition of the unfermented and fermented rice husk meal. The proximate composition of fermented rice husk showed that fermentation improved the nutrient content. The dry matter, crude protein, ether extract and nitrogen free extract increased with fermentation while Ash and crude fibre reduced. The improvement might be attributed to anaerobic fermentation by the rumen microbes. Table 2 showed that dietary treatments significantly ($p<0.05$) improved weight gain. Live weight, feed intake, feed conversion ratio and mortality were however, not influenced ($P>0.05$) by dietary treatments. Weight gain results showed that birds on T4 and T5 were significantly ($p<0.05$) higher than the birds on the control and T2 treatments. This could be as a result of better nutrient derived from fermentation of the rice husk as recorded in the proximate analysis results. The significant influence ($p<0.05$) on weight gain among the treatment groups agrees with the findings of Aanuoluwapo and Gbenga (2014) who fed rumen-fermented wheat-bran based diets to broiler chickens and also reported that the live weights , feed intake, and feed conversion ratio were not influenced by the dietary treatments except weight gain.

The effect of dietary treatment on haematological indices of broiler chickens is shown in Table 3. The results showed that the Packed cell volume (PCV),White blood cells (WBC), Red blood cells (RBC), Haemoglobin (Hb) and Mean corpuscular volume (MCV) were not affected ($P>0.05$) by the diets except the mean cell haemoglobin concentration.

Results of the mean cell haemoglobin concentration showed that chickens on dietary treatments 1, 2, 3and 4 had similar ($P>0.05$) mean cell haemoglobin concentration values. Similarly, chickens on Treatments 1, 2, 3 and 4 had similar ($p>0.05$) MCHC values. However, chickens on T5 had higher ($p<0.05$) MCHC value than those of birds on T1 and T4. The higher value obtained in T5 in this study is an indication of the quality of the test diet which also reflected in significant ($P<0.05$) higher weight gain obtained in this treatment. The haematological values obtained fell within the ranges presented by Ross *et al*.(1978) which implies that the chickens were able to tolerate the experimental diets health-wise.

CONCLUSION

The results as shown above indicate that the fermented rice husk meal can serve as an alternative energy source in broiler feed, which had a substantial increase in crude protein content without any adverse effects on the haematological indices of the broilers.

Based on the results obtained in this study, rumen fermented rice husk meal diets can be included in the diets of broiler chickens up to 20 % without detrimental effect. It is recommended that further research work should be carried on the use of rumen liquor fermentation of rice husk meal in formulating diets for other categories of chicken.

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Table 1: Proximate composition of unfermented, fermented rice husk and their percentage change

Parameters	Unfermented rice husk	Fermented rice husk	% change
Dry matter (%)	91.37	90.30	3.65
Crude protein (%)	6.04	8.87	23.25
Ether extract (%)	2.21	5.00	55.80
Ash (%)	13.90	2.54	-447.24
Crude fibre (%)	42.12	29.33	-57.25
Nitrogen free extract (%)	27.10	43.74	38.04
Energy (Kcal/Kg)	1366.31	2289.96	40.33

Table 2: Effect of fermented rice husk on growth (g), live weight (g), feed intake (g), feed conversion ratio and mortality of Broiler finisher

Parameter	T_1	T_2	T_3	T_4	T_5	SEM
Growth	13.87^{ab}	11.76^{b}	14.50^{b}	14.68^{a}	14.80^{a}	17.143
Lw	631.91	558.58	661.24	614.94	654.26	0.418
FI	45.62	48.73	53.11	50.98	60.13	2.012
FCR	3.37	4.16	3.68	3.68	4.07	0.167
Mortality	0.00	0.00	0.00	0.00	0.00	0.00

Means with different letter along the same row are significantly different ($p<0.05$).
Key: T_1: control (0 % rice husk; T_2: 5 % fermented rice husk); T_3:10 % fermented rice husk; T_4:15 % fermented rice husk; T_5: 20 % fermented rice husk; SEM: Standard error mean LW: Live weight FI: Feed intake FCR: Feed conversion ratio

Table 3: Effect of rumen filtrate treated rice husk meal diets on haematological parameters of broiler chicken

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
WBC ($x10^9$/L)	65.41	41.52	34.30	69.46	64.16	7.60
LYM (%)	49.16	31.49	28.86	55.35	41.71	5.60
RBC ($x10^6$/L)	1.21	0.78	0.57	1.48	1.07	0.13
HGB (g/dL)	86.50	57.00	42.00	102.50	81.00	9.46
PCV (%)	17.15	9.92	7.49	14.25	13.53	1.62
MCV (%/g)	141.00	126.50	131.00	105.57	126.50	8.08
MCH (g/dL)	70.85	73.20	72.30	69.45	75.85	1.08
MCHC (g/dL)	503.50^{b}	578.00^{ab}	541.00^{ab}	501.00^{b}	599.50^{a}	15.37

Means with different letter along the same row are significantly different ($p<0.05$).
SEM Standard error of mean; Key WBC: White blood cells; LYM : Lymphocyte; RBC :Red blood cell; HGB: Haemoglobin; PCV :Packed cell volume; MCV: Mean cell volume; MCH:Mean cell haemoglobin; MCHC :Mean cell haemoglobin concentration.