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Original article

Effect of ensiling and enzyme supplementation on rice husk fed to broilers chicken at starter phase

A.S. Balogun[a,*], A.O. Fasuyi[b], O.A. Jimoh[c]

[a]*Department of Animal Health and Production Technology, Oyo State College of Agriculture, Igboora, Oyo State.*
[b]*Department of Animal Production and Health sciences, Ekiti State University, Ekiti State.*
[c]*Department of Agricultural Technology, Federal Polytechnic Ado-Ekiti, Ekiti State.*

*Corresponding author; Department of Animal Health and Production Technology, Oyo State College of Agriculture, Igboora, Oyo State.

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A B S T R A C T

Freshly milled Rice husk was obtained and ensiled for varying lengths of 7,14,21 and 28 days using a ratio 1,1,0.05 of water, Rice husk and molasses. The ensiled Rice husk was opened and sun dried for 3days at the end of each ensuing period until a moisture content of between 12-13% was attained. Diets were formulated for respective treatments, with treatments 2, 4, 6, 8 and 10 having Roxazyme G2 inclusion level of 2%, treatments 1, 3, 5, 7, 9 and 11 are without Roxazyme G2. Result obtained shows that birds on Roxazyme G2 inclusive diets had a higher weight gain than their duplicate diets, except for diets 10 and 11 which are having a similar (P>0.05) weight gain of (73.6±4.2a). Feed intake of birds on diet 1 was the least (34.3g±0.3) although significantly (P>0.05) similar to values obtained for birds on other diets (Treatment 2 - 11). The Nitrogen Retention values were similar (P>0.05) for birds on all diets except for diet 10 and 11 which were significantly different (P<0.05).There was no mortality during the experimental period. The cost of finished feed diet expectedly revealed that the control diet was the most expensive diet at 5 naira/100g followed by the reference diet (diet 2), diet 4, 6, 8, and 10 in which Roxazyme G2 was present, having the same value of 7.5 naira/100g. Result of the study suggest that inclusion level of fibre ingredient and Roxazyme G2 in broiler starter diets may be nutritionally beneficial in poultry feeding and subsequently reduce the use of the expensive animal energy sources in practical feed formulation.

1. Introduction

The issue of prices and supply irregularity of quality maize is very disturbing and the current trend of scientific thinking is an alternative sources that can partially or fully replace poultry feeds. Serious attention has been given to the use of plant proteins especially cereals seeds but problems like presence of antinutritional factors, competition with utilization by man and other livestock and amino acid imbalance have to be put into consideration. Feed and feeding in poultry production is as important as genetic factor (North, 1978). In addition to the genetic component of the bird, the quality of feed is the primary factor that determines the rate of growth of bird (Oluyemi and Roberts, 1985).

Monogastric animals are known not to utilize fibrous feedstuffs efficiently. The reason being that there is no meaningful symbiotic relationship between the animal with simple stomach and microbial population anywhere in the gut (Moran, 1982). This leads to decrease in digestive efficiency especially with diets that have low energy content i.e. high fibre content. The fact that poultry is a monogastric animal indicates that it has limited ability to digest fibre. (Moran, 1982).Crude fibre consists of cellulose, hemi-cellulose and lignin (McDonald et al., 1982) which although are carbohydrates, are not well utilized by monogostric animal including chicken (Moran, 1982). Fibre is known to increase the rate of feed passage in the gastro-intestinal tract, reducing digestibility.

Rice husk as fibrous feed is available in many parts of the world in large quantity as a by-product of rice milling industry. It consists primarily of outer covering of rice (Oyawoye and Nelson, 1998). It is an inexpensive source of fibre, obtained almost free and is considered as filler ingredient. It is high in fibre (28% crude fibre) but low in protein and fat. But because of its little or no cost, it is used as feed ingredient and thereby reduces the cost of production. Monogastric animal, including poultry are assumed to be able to utilize rice husk as a feed ingredient better when additives like grits or enzymes are added to it. Methods suggested at reducing limiting factors in rice husk utilization includes soaking in hot water, irradiation, acid and alkaline hydrolyses, ensiling, fermentation and use of enzymes and antibiotics (Longe, 1988 and Dierick et al., 1989).

Biological improvement of rice husk which include the use of microbial inoculants, celluloytic enzymes antibiotics and probiotics are easy and safer to handle. It is neither volatile nor corrosive, aimed at breaking down cell wall components to provide wealth of readily available nutrients. According to Edward (1972) enzymes from microbes have more advantages than the commercially prepared enzymes. This is study is therefore carried out in other to exploit the availability and abundant potential of rice husk, especially when it undergo additional treatment like ensiling. Moreover, now that maize is very costly and cannot be afforded by an average Nigerian, this call for higher demand of rice and also will make the by products available in large quantity for use. This study is therefore aimed at harnessing the potential of local rice bran/husk in poultry rations when subjected to various ensiling length prior to incorporation into feed formulation and further supplementation with enzymes (Roxazyme G2)) at the starter phase (1-28days) of broiler chicken production. And also to investigate the biochemical, nutritive, physico-chemical properties of ensiled rice husk as a significant carbohydrate/protein nutrient supplement in broiler diets and to further enhance the utilization of the RH by enzymes supplementation, to examine the effects and benefits (if any) of ensiling rice husk as a prelude to including it in feed formulation for broiler birds, also to compare the performance and haematological indices of chickens fed diets containing RH (at 4 different ensiling dates) with and without enzymes supplementation at the starter phase.

2. Materials and methods

2.1. Preparation of test ingredient (ERH)

Rice husk (RH) was obtained from a local rice miller in Igbimo Ekiti a locality known for its rice production in Ekiti state. The RH was later transported to the Teaching and Research Farm of the University of Ado-Ekiti. Mixtures of the RH and molasses were prepared using a ratio 1,1, 0.05of water, RH and molasses. The process of ensiling the mixtures of RH and molasses was carried out using strong 120litre capacity plastic containers with air tight lids Container containing the ensiled RH-molasses mixtures were opened on 7, 14, 21 and 28day, respectively. On each selected day (7, 14, 21 and 28) samples of the ensiled mixtures were collected to determine the proximate composition. Sun-drying was done for a period of 3 days while the RH-molasses mixtures was manually turned for uniform drying during the 3-days sun-drying until moisture content remained constant at 12%.

2.2. Experimental ration formulation

The feed ingredient was purchase from a reputable feedmill at Ado-Ekiti called Metro-Vet feed-mill in Ekiti State. The unensiled and ensiled RH which have been dried and analyses was compounded with all other ingredient to make the experimental diets. All diets were compounded to be isonitrogenous and isocaloric. Diet 1, the control diet contain no RH. Diets 2 and 3 as the reference diet with unensiled RH with and without enzyme supplementation respectively, Diets 4 and 5 contained 1 week ensiled RH with and without enzyme supplementation respectively, Diets 6 and 7 contained 2 weeks ensiled RH with and without enzyme supplementation respectively, Diets 8 and 9 contained 3 weeks ensiled RH with and without enzyme supplementation respectively while Diets 10 and 11 contained 4 weeks ensiled RH with and without enzyme supplementation respectively. Rice husk was included at rate of 15% in all the diets (2-11) except for control and also Roxazyme G2 was included at the rate of 2% for diets (2, 4, 6, 8, 10).

2.3. Management of experimental birds and experimental design

A total of 132 day old broiler chicks was purchase from CHI (Ajanla Farms) at lagos ibadan express way Oyo state. The chicks were brooded in metabolic cage, and electric bulb, charcoal pot were use as source of heat for the broiler for the first 1-2weeks of the commencement of the experiment. They were fed broiler-starter commercial ration ad-libitum for the first 1-5 days of arrival in order to stabilized them prior to the commencement of the experiment i.e. prior to the feeding them with the test ingredients. Water was also provided ad-libitum and appropriate antibiotics and anti-stress, particularly after arrival was administered. Appropriate vaccination and medication programme was followed as recommended by the hatchery.

The experimental design used was randomized block design (RBD) a total of 21 experimental units. The chicks were assigned 12chicks per diets in 2 replicates of 6 chicks such that the mean group weights were similar. The chicks were fed the experimental diet ad libitum for 21days during which records on daily feed consumption and 3 days periodic weight gains were recorded.

2.4. Estimation of nitrogen intake, nitrogen retention and protein efficiency ratio

Total feaces voided during the last 5days of the experiment were collected, weighed, dried at 65-70°C in an air circulating oven for 72 hours and preserved while the corresponding feed consumed was also recorded for nitrogen studies. The nitrogen contents of the samples were determined by the method of AOAC (1995). Nitrogen retained was calculated as the algebraic difference between feed nitrogen (on dry matter basis) for the period. The "operative" protein efficiency was calculated as the ratio of weight gain to total feed consumed.

2.5. Blood collection for analysis

At the end of the feeding trial all birds were starved overnight. One male chick from each replicate was randomly picked and blood collected through the wing-web vein using 2ml syringe and needle. Blood samples collected were put inside labeled bijou bottles containing a speck of EDTA, the bottles were covered and content mixed by inversion. The bloods collected were used for haematological studies. The packed cell volume (PCV%) was estimated in heparinized capillary tubes in an haematocrit micro centrifuge for 5minutes with 1400 RAM, total red blood cell (RBC) count was determined using Drabkin solution to easily recognize Red blood cells from other component of the blood under microscope. The haemoglobin concentration (HBC) was estimated while Mean Corpuscular Heamoglobin Concentration (MCHC) Mean Corpuscular Volume (MCV) were calculated.

2.6. Statistical analysis

The various data obtained were subjected to analysis of variance (ANOVA) at $P = 0.05$. Differences in mean value will be consider significant at the probability level $P < 0.05$, The means were compare using the Duncan Multiple Range Test (Duncan 1995).

3. Results

3.1. Proximate composition of ensiled and unensiled rice husk (urh)

The results of proximate composition of (ERH) and (URH) was presented in table 1. The ash content of 3wks(ERH) was higher than other weeks and unensiled rice husk, % moisture content was also higher at 2wks(ERH) than other ensiling weeks, including raw rice husk, % crude fibre and crude protein was higher at 4wks of ensiling, % fat was also high in (URH) and decreases gradually across the weeks of ensiling and the % nitrogen free extract also give a considerable high value at 1wk (ERH) and decreases across the weeks of ensiling.

Table 1
Proximate Composition of Ensiled and Un-ensiled Rice Husk (URH).

Weeks	% Ash	%Moisture content	%Crude protein	%Crude fibre	% Fat	% NFE
1	19.04	10.60	4.76	42.51	1.69	32.00
2	23.19	14.60	4.92	42.38	1.64	27.88
3	23.72	10.54	5.07	41.66	1.59	27.97
4	22.76	10.65	5.26	43.34	1.54	27.11
URH	21.24	8.26	4.88	42.34	1.70	29.84

The baseline tPA values for both groups (Table 1) were greater than values previously reported in the literature (0.27 to 0.45 IU/mL) (Delgado et al., 2009). After surgery, the tPA level was significantly increased in both groups above the normal range when comparing the groups across all time-points (p = 0.0069), with median values of 2.6 IU/mL (CG) and 2.0 IU/mL (TG) (Table 2). This comparison between the groups at different time-points showed that, although the tPA concentrations were lower in the TG throughout the treatment period, there were no significant differences between time-points (Table 1).

The baseline values for PAI-1 were also higher than those reported in the literature (0 to 2.37 IU/mL) (Delgado et al., 2009). However, there was no change in this concentration after surgery, with no significant difference (p = 0.7022) between groups or time-points (Tables 1 and 2).

The baseline values of D-dimer were below the reference values (4.0 to 88.0 ng/mL) (Delgado et al., 2009), with detected concentrations < 0.5 ng/mL. After surgery, considerably higher values were obtained for the CG, with median values of 4000 ng/mL (CG) and 1500 ng/mL (TG) (Table 2). However, there were no significant differences (p = 0.0745) between groups when all time-points were combined (Table 1).

3.2. The performance characterisitcs

The performance characteristics of the birds fed ensiled rice husk (ERH) at varying ensiling lengths of 1, 2, 3 and 4 weeks with and without enzyme supplementation are shown in table 3. Birds fed control diet (1) had the highest value for feed intake (146.95g/bird/day ± 0.21) but similar to (P>0.05) birds on diets 8 and 9. Birds fed diet 10 had the lowest value of 123.10g/bird/day ±1.56 for feed intake but similar (P>0.05) to birds fed diet 2 (123.45g/bird/day ±1.34). The average weight gain for the entire experimental period of 28 days showed that the weight gain values of the birds on all diets (2-11) including the control diet (1) were similar (P>0.05) with the exception of diet 10 which had the significantly lowest weight gain value(P<0.05) of 52.65g/birds/day ±1.34. Birds on the control diet 1 and diet 8 had the highest FCR values of 2.44g/bird/day ± 0.00 and 2.46g/bird/day ±0.63 respectively. The FCR values for birds on the control diets 1 and 8 were similar (P>0.05) to other FCR values obtained for birds on other diets.

3.3. Nitrogen utilization

Table 4 presents data on nitrogen utilization. The nitrogen intake (NI) value of chicks were all similar (P>0.05) except for birds on diet 10 and 11 which was significantly different (P<0.05) with lowest values of 1.76±0.20 and 1.70±0.40 respectively. Chicks on diets 9 without Roxazyme G2 supplementation had the highest value of 2.93±0.40 but were similar (P>0.05). The nitrogen retention (NR) of chicks on the experimental diets were similar (P>0.05) except for that of chicks on diets 8 and 9 which are significant high (P<0.05) with values of 1.40±0.24 and

1.10±0.30 to those chicks on diet 4, 5, 6, 7 and 10 having values of 1.17±0.17, 1.12±0.20, 1.10±0.03, 1.02±0.20 and 0.80/chick/day respectively. Apparent nitrogen digestibility was also high in diets 8 and 9 compare to other diets, and statistically similar (P>0.05) to control diet.

3.4. Haematological indices

Haematological values are presented in Table 5. Parameter investigated includes, PCV%, RBC Count, HBC, MCHC, MCV and ESR. All Showed no significant differences among their treatment mean values (P>0.05).

Table 2

Composition of the Experimental Diets, Including ERH With and Without Enzyme Supplementation.

				DIETS							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
	Fermentation period of rice husk before incorporation into diets (days)										
Ingredients	**control**	**Ref. diet***	**Ref. diet**	**7d***	**7d**	**14d***	**14d**	**21d***	**21d**	**28d***	**28d**
Maize (11.0% CP)	51.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0	41.0
Soyabean meal (45.0%CP)	16.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Brewers dried grain (27.9%CP)	15.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Wheat offals (15.3%CP)	12.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Fish meal (68.1%CP)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Rice husk**		15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Palm oil				2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Bone meal	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Oyster shell	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Premix***	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
DL-methionine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Lysine	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Salt	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total	100.0	100	100	100	100	100	100	100	100	100	100
Crude Protein	22.55	21.62	21.62	21.62	21.62	21.62	21.62	21.62	21.62	21.62	21.62
Energy (Kcal/Kg)	2900.9	2806.3	2806.3	2806.3	2806.3	2806.3	2806.3	2806.3	2806.3	2806.3	2806.3

*Enzyme supplementation **Av. crude protein content of rice husk, 4.76% at 7th day, 4.92% at 14th day, 5.07% at 21st day and 5.26% at 28th day.*** contained vitamins A (10,000,000iu); D(2,000,000 iu); E (35000 iu); K (1900mg); B12 (19mg); Riboflavin (7,000mg); Pyridoxine (3800mg); Thiamine (2,200mg); D Pantothenic acid (11,000mg); Nicotinic acid (45,000mg); Folic acid (1400mg); Biotin (113mg); and Trace elements as Cu (8000mg); Mn (64,000mg); Zn (40,000mg); Fe (32,000mg) Se (160mg); I2 (800mg) and other items as Co (400mg); Choline (475,000mg); Methionine (50,000mg); BHT (5,000mg) and Spiramycin (5,000mg) per 2.5kg.

Table 3

Performance of broiler chicks feed ERH of varying ensiling Length with and without enzyme supplementation Means with different superscript in the same row differ significantly (P< 0.05) * enzyme supplementation.

	Diets										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
		Fermentation period of rice husk before incorporation into diet (days)									
	Control diet	**Ref. diet***	**Ref diet**	**7d***	**7d**	**14d ***	**14d**	**21d***	**21d**	**28d***	**28**
AWG/Chick	67.1 ±6.8^{a}	73.0± 2.7^{a}	71. ±7 1.6^{a}	71.6± 1.9^{a}	59.9± 1.5^{a}	67.95± 1.01^{a}	70.6 ±1.8^{a}	60.6±9.6 ^{a}	59.1± 6.3 ^{a}	73.6± 4.2 ^{a}	73.6±4.2^{a}
AFI/g/bird/day	34. ±3 0.3 ^{a}	38.1 ±0.28 ^{a}	38.2. ± 0.0 ^{a}	38.1± 0.92 ^{a}	37.6±1.5 ^{a}	37.5±1.2 ^{a}	38. ±5 1.2 ^{a}	37.1 ±2.8 ^{a}	35.1± 2.8 ^{a}	37.7± 1.1 ^{a}	37.3± 0.6 ^{a}
FCR	0.53± 0.566 ^{a}	0.52± 0.014^{a}	0.53± 0.014^{a}	0.53±0.283^{a}	0.63 0±.14 ^{a}	0.55± 0.071^{a}	0.50±.00^{a}	0.54± 0.050^{a}	0.60±0.110^{a}	0.560±.042^{a}	0.510±.021^{a}

Table 4

Nitrogen Utilization of broiler fed ERH of varying ensiling lengths with and without enzyme supplementation.

			Diets								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
			Fermentation period of rice husk before incorporation into diet (days)								
Parameters	**Control diet**	**Ref diet***	**Ref. diet**	**7d***	**7d**	**14d ***	**14d**	**21d***	**21d**	**28d***	**28d**
NI/gN/bird/day	2.07±0.10^{a}	2.34±0.26^{a}	2.24±0.44^{a}	1.97±0.44^{ab}	1.96±0.22^{a}	2.13±0.40^{a}	2.61±0.20^{a}	2.43±0.22^{a}	2.93±0.40^{a}	1.76±0.20^{b}	1.70±0.40^{b}
NR/gN/bird/day	1.21±0.24^{ab}	1.20±0.29^{ab}	1.26±0.30^{ab}	1.17±0.17^{b}	1.12±0.20^{b}	1.10±0.03^{b}	1.02±0.20^{b}	1.40±0.24^{a}	1.10±0.30^{a}	0.80±0.03a	0.70±0.10^{ab}
AND(%)	56.7±12.5^{a}	55.7±6.4^{ab}	53.9±6.5a^{b}	58.1±15.9^{ab}	57.9±16.0^{ab}	48.4±7.0^{bc}	47.1.1±7.0^{a}	63.1±8.2^{a}	61.0±10.2^{a}	46.7±6.8^{c}	45.3±6.0^{c}

AND- Apparent nutrient digestibility; NI- Nitrogen intake; NR- Nitrogen retention. Means with different superscript in the same row differ significantly (P< 0.05) * enzyme supplementation .

Table 5

Haematological Indices of Broiler Birds Fed ERH of Varying Ensiling Lengths With and Without Enzyme Supplementation.

	1	2	3	4	5	6	7	8	9	10	11
			DIETS								
		Fermentation period of rice husk before incorporation into diet (days)									
Parameter	**Control diet**	**Ref diet***	**Ref diet**	**7d ***	**7d**	**14d ***	**14d**	**21d ***	**21d**	**28d***	**28d**
Hbc (g/100ml)	7.65±1.48^{a}	7.45±0.49^{a}	7.60±0.84^{a}	6.55±0.49^{a}	7.3±0.42^{a}	7.25±0.70^{a}	7.55±0.21^{a}	7.35±0.63^{a}	6.35±1.34^{a}	6.35±0.63^{a}	6.25±0.91^{a}
PCV (%)	26.50±2.12^{a}	36.0±2.01^{a}	34.5±2.12^{a}	35.1±2.12^{a}	35.0±5.65^{ab}	29.1±1.45^{ab}	28.6±2.11^{a}	32.0±2.24^{a}	27.5±0.7^{a}	24.5±2.0.7^{ab}	33.0±0.1^{a}
RBC(x106/mm3)	2.55±0.59^{a}	2.65±0.45^{a}	2.50±0.43^{a}	2.64±0.33^{a}	2.57±0.31^{a}	2.55±0.28^{a}	2.77±0.07^{a}	2.91±1.14^{a}	2.96±0.33^{a}	2.48±0.63^{a}	2.7±0.42^{a}
MCHC (%)	20.87±3.3^{a}	20.7±1.4^{a}	25.45±4.3^{a}	21.15±1.6^{a}	25.5±2.75^{a}	25.5±2.12^{a}	23.95±1.9^{a}	23.05±1.1^{a}	23.05±4.31^{a}	23.95±3.32^{a}	19.55±2.75^{a}
MCH (pg)	29.65±0.49^{a}	28.35±3.04^{abc}	30.85±1.90^{a}	22.6±1.55^{a}	28.85±1.90^{ac}	28.5±297^{bc}	27.9±1.55^{ac}	25.3±0.01^{ac}	25.6±1.55^{ac}	23.65±0.63^{a}	23.95±0.35^{c}
ESR(mm)	1.19±0.01^{a}	1.37±0.23^{a}	1.43±0.16^{a}	1.32±0.03^{a}	1.20±0.14^{a}	1.24±0.04^{a}	1.2±0.12^{a}	1.25±0.13^{a}	1.39±0.20^{a}	1.26±0.04^{a}	1.21±0.06^{a}

Hb- Hemoglobin concentration; PCV- Pack cell volume; RBC- Red blood cell; MCHC- Mean corpulus hemoglobin concentration; MCH-Mean cell hemoglobin; Means with different superscript in the same row differ significantly (P< 0.05) * enzyme supplementation.

Table 6

Cost Implication of the Broilers Fed ERH of Varying Ensiling Lengths With and Without Enzyme Supplementation.

	1	2	3	4	5	6	7	8	9	10	11
			DIETS								
	Fermentation period of rice husk before incorporation into diets										
Parameter	**Control diet**	**Ref diet***	**Ref diet**	**7d***	**7d**	**14d***	**14d**	**21d***	**21d**	**28d***	**28d**
Average total weight gain	60.20	55.45	56.90	57.00	57.30	58.95	58.35	58.35	60.25	56.25	56.25
Average total feed intake	146.90	128.10	129.30	129.50	132.60	137.20	144.10	144.10	144.50	123.10	125.45
Cost of feed N/kg	8.50	7.50	7.0	7.50	7.5	7.0	7.0	7.0	7.5	7.0	7.5
Cost of feed consumed g/bird	5.11	4.16	4.00	4.30	4.30	4.13	4.13	4.10	4.50	3.90	4.22
Cost of feed consumed/ (g) weight gain (N)	0.08	0.08	0.07	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.08

Cost of feed excludes overhead cost such as labour and transportation

3.5. Economics of production (cost benefit analysis)

The economics of production/cost implication is presented in table 6. The costs of the diets were calculated using the prevailing current prices of the feed ingredients shown in Table 1. The costs of diets were calculated with the assumption that labour cost and other overhead costs were similar and uniform for all the 11 diets and therefore were not calculated in the calculation. The cost of the finished feed (diets) expectedly revealed that the control diet of 8.50N was the most expensive, followed by the reference diet ,diet2, 4, 6, 8 and 10 in which Roxazyme G2 was present, having the same value of 7.7 naira/100g.

The cost of feed per weight gain was considerably lower for chicks on diet without Roxazyme G2 supplementation than their fellow duplicate diets. This was observed in diets 2 & 3,4 & 5, 6 & 7, 8 & 9 and 10 & 11, with diet 1 having the highest value of 0.08.

4. Discussion

It was obvious that birds fed ensiled rice husk based diets with Roxazyme G2 supplementation had the best performance characteristics in terms of feed-intake, weight gain and feed conversion ratio (FCR).

The broiler diet in which 0wk, 1wk, 3wks ERH was incorporated at 10% inclusion level with Roxaxyme G2 supplementation was found to have higher weight gain values than their duplicates in which Roxazyme G2 was absent. Although these value were statistically similar to the WG values recorded for broiler chicks fed diets 1, 6, 7, 10 and 11(with & without Roxazyme G2 supplementation).It was noteworthy that WG values recorded for broiler chicks fed diets supplemented with Roxazyme G2 was higher than WG value recorded for birds on control diet. Benefits have been realized by enzyme supplementation in poultry diets and such benefits include improvement in digestibility, reduction in excretion of nitrogen and phosphorus, increase use of alternative feed ingredients, reduction in variation of nutrient quality of feed ingredients and reduction in feed wastage when feeding diets rich in viscous grains. (Bedford2000).

It was evident that the feed intakes of all the birds fed diets with Roxazyme G2 supplementation were appreciably better than their duplicates in which Roxazyme G2 was absent. Although it was not significantly different from the feed intake value obtained for the birds on control diet.

The use of plant and its by-products in poultry diets is generally inhibited by the high fibre levels and some anti-nutritional factors present (Fasuyi, 2007, Aletor & Adeogun, 1995). It is therefore conceivable that the supplementary addition of Roxazyme G2 would have broken down the cellulose and other non-starch polysaccharides which are bound together in a complex matrix making the bound nutrient readily available in forms that could be utilized by monogastrics.

The birds on diets with enzyme supplementation especially the 3wks ERH based diet had better FCR values compared to their counterparts without enzyme supplementation and this is in agreement with several studies with reports that enzyme supplementation of poultry diets produced significant positive responses to growth performance (Wyatt et al., 1997; Pack et al., 1998). Roxazyme G2 dietary supplementation had the potentials of splitting the complex non-starch polysaccharides such as cellulose, xylans and beta-glucans with a resultant improved utilization of fibre ingredients and digestibility of nutrients. It also reduced the losses of endogenous amino acids resulting in the conservation of endogenous utilizable energy that may be otherwise used for protein accretion (Zabella et al., 1999).

The nitrogen intake, nitrogen retention and apparent nitrogen digestibility of birds fed 21days ERH was the highest compare to others. This potential may have been realized through the ensiling length, meaning that 21days may be best ensiling length for rice husk and also the contribution of Roxazyme G2 enzyme to make the harnessed nutrient in ERH to be available cannot be underestimated. This indicate the benefit of enzyme addition to diets containing high fibre lies in the increased access to the intracellular entrapped nutrient as well as in improved energy utilization (Kocher et al., 2003).

Hematological parameters investigated were within range. The mean cell volumes(MCV) obtained for all birds is in agreement with standard values reported in previous literature (Awotuyi, 1990;Aletor and Egberongbe,1992) who reported 2.2 and 100/mm3 respectively. The blood variables most often affected by dietary influences were identified as PVC, plasma protein, glucose and clotting time. (Aletor, 1993). On a similar note the MCHC, MCH, and HBC were not significantly affected (P>0.05) by the dietary treatments contents. The ESR of the diets did not predispose the birds to any known general infections or malfunction of any kind. Fredson (1986) reported that ESRs are increased in cases of acute general infection, malignant tumors and pregnancy.

It is evident in table 5 that the cost of feed reduced with introduction of Roxazyme G2 to diet 1 (control diet) was the most expensive feed. However, the cost of feed/g weight gain indicated that birds on diets without Roxazyme G2 supplementation had the least cost formulation with consideration of totality of growth performance and other relevant cost indices. This may be attributed to the fact that birds on diets with Roxazyme G2 supplementation consumed and convert more on diets without Roxazyme G2 supplementation.

5. Conclusion

There was a positive nutritional implication due to the inclusion of ERH into broiler diets particularly with Roxazyme G2 supplementation. This may translate into economic gains in broiler production as local rice milling produces abundant rice husk that can be utilized for purpose of broiler feed manufacturing. The introduction of ERH in broiler starter diet at different ensiling period has no obvious deleterious effect on the birds. The weight gain, feed intake, average feed consumption as performance indices all show values fairly comparable with the control diet which there was no inclusion ERH and Roxazyme G2. There is no doubt that the supplementary inclusion of Roxazyme G2 in boilers diet containing varying ensiling length of ERH had a beneficial on the performance of the birds suggesting that Roxazyme G2 may have contributed in freeing the bound and unavailable nutrients in the ERH.

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