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PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS AS INFLUENCE BY MELON (*Citrullus vulgaris*) HUSK

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ABSTRACT

This experiment was conducted using one hundred and eighty (180) day- old marshal chicks randomly assigned in a Completely Randomized design to evaluate the effect of inclusion of differently treated melon (*Citrullus vulgaris*) husk on the performance, carcass characteristics and serum profile of broilers. Dried melon husks were collected and subjected to three (3) processing methods. The first portion was mechanical ground using hammer mill and sieved, the second portion was soakedfor 30 minutes in warm water at the rate of 100kg melon husk per 50 litres of warm water before sun drying; and the third portion was fermented with rumenliquor for 72 hours at room temperature at the rate of 50kg melon husk per 10 litres of rumen liquor. During the *43- d* feeding trial period, birds were fed *ad lib* with experimental diets D1, D2 and D3 representing 15% inclusions of Mechanically Treated Melon Husk (MTMH); Soaked Melon Husk (SMH) and Rumen Liquor Fermented Melon Husk (FMH) respectively. Body weight gain (BWG), feed:gain (FCR) and survival percentage (%) were significantly ($p<0.05$) affected by treatment method with D3 values being greater than D2 and D1. Dressed weight, thigh/drumstick, wings, breast bone, were significantly ($P< 0.05$) affected by melon husk treatment method. The highest average body weight (2.23 kg), dressed weight, and thigh/drumstick, wings, breast bone, rib cage and back were observed in the D3 group. The serum biochemical and hematological values obtained in the study differed significantly ($P< 0.05$) between experimental treatments but are within standard ranges. It was concluded that melon husk can be included as a feed ingredient for broilers without any significant deleterious effects on their performance, haematology, serum and carcass quality indicators. However, processing of melon husk was shown to improveitsnutrient composition, therefore, 15% inclusion level of rumen liquor fermented melon husk was recommended for better performance of broiler chickens.

Keywords: Broiler Chickens, Carcass, Melon Husk, Performance

INTRODUCTION

The rising utilization of environmentally friendly processes in closing the feed resource supply gap and also in addressing the competitiveness in the supply of conventional feeds in the Nigerian poultry industry has remained a major focus of research. Melon (*Citrullus vulgaris*) husk and rumen liquor are common environmental nuisances especially in the North Central States of Nigeria where there are high production of melon and a number of abattoirs and slaughter slaps. Melon husk have shown potentials for utilization as unconventional feed resources (Abiola *et al*., 2002; Ogbe *et al*., 2013) while rumen liquor are regarded as enhancers of feeding values of

agricultural waste materials for monogastric animal nutrition (Darwazeh, 2010; Adesua and Onibi, 2014).

Akinfemi (2010) reported that the melon husks are gotten after shelling the melon seeds which are usually discarded and burnt resulting in polluted environment. These large quantities of melon husks thrown as waste could be recycled by environmentally friendly methods into livestock feeds thereby reducing the threat of acute shortage of conventional feed ingredients to the Nigerian poultry industry.

Various methods (physical, chemical and biological) of processing agricultural waste have been reported (Adeyemi*et al*., 2008; Akinfemi, 2010; Ari et al., 2012; Ari and Ayanwale, 2012; Ogbe *et al*., 2013; Ari, 2014). The use of mechanical processes in reducing the particle size of agricultural waste, soaking in water and alkali as well as fermentation using rumen filtrate, white rot fungi of the genus *pleurotus* (mushroom) among others, offers good opportunity for improving the nutritional values and utilization of agricultural waste as livestock feeds.

The basic assumption in the current study was that utilization of melon husk in poultry diets will differ depending on the method used in processing the melon husk prior to incorporation. The objective of this study is therefore to evaluate the effect of inclusion of differently treated melon (*Citrullus vulgaris*) husk on the performance, carcass characteristics and serum profile of broilers.

MATERIALS AND METHODS

Location of the study

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm, Faculty of Agriculture, Nasarawa State University Keffi, Shabu-Lafia Campus, Nasarawa State located along Latitude $08^0$35'N and Longitude $08^0$33'E in the Guinea savanna zone of North Central Nigeria (NIMET,2008)

Management of Experimental Birds

A total of one hundred and eighty (180) day - old marshal chicks were used for the experiment. The chicks were individually weighed and randomly assigned to three (3) dietary treatments consisting of three (3) replicates each containing twenty (20) birds in a Completely Randomized Design (CRD). The birds were reared in an open sided well-ventilated poultry house on deep litter system of production. Routine management practices (sweeping, cleaning and feeding) and routine administration of vaccines against Infectious Bursal Disease and New Castle Disease were undertaken and the birds were fed *ad libitum* and had access to clean drinking water.

Experimental diets

Dried melon husks were collected from the rural women in Tudun Gwandara, Lafia Local Government Area of Nasarawa State. These women are engaged in the processing of melon seeds (also called "egusi") for commercial purpose. The melon husks were further subjected to three (3) processing methods viz: mechanical grinding using hammer mill (sieve size of 3mm); soaking in warm water at the rate of 50 litres/100 kg of melon husk for 30 minutes before 48 hours sun drying; and fermentation with rumen liquor collected from local abattoir, sieved and sprayed on partially crushed melon husk at the rate of 50 kg of melon husk to 10 litres of rumen liquor. Fermentation process lasted for 72 hours at room temperature thereafter the fermented melon husk was sundried.

The experimental diets were formulated using least cost feed formulation software ***Feedwin*** to provide 3,000 Kcal, 24% CP at starter stage and 3,100 Kcal, 22% CP at the finisher phase, respectively as indicated in (Table 1).

The three (3) dietary treatments are as follows:

I. Dietary treatment 1– contained 15% inclusion level of Mechanically Processed Melon Husk (MPMH) in the diet.

II. Dietary treatment 2– contained 15% inclusion level of Soaked Melon Husk (SMH) in the diet.

III. Dietary treatment 3 – 15% inclusion of Fermented Melon Husk (FMH) in the diet.

The starter diets were fed for four (4) weeks (1-28 d) during the brooding phase while the finisher diets were fed for two (2) weeks (29-43d). All necessary vaccination, heat supply and preventive medications were appropriately provided.

Data Collection

Performance parameters

The following parameters were measured and computed from the data generated from daily and weekly recordings during the feeding trials: feed intake, body weight, body weight gain, feed conversion ratio (feed:gain), mortality and survival percentages according to the methods adopted by Ari (2014).

Blood sample collection

At the end of the feeding trial, Blood samples were collected from five (5) birds in each of replicate. Packed Cell Volume (PCV), haemoglobin and cholesterol were determined by the methods of Green (1976) and Aletor and Ogunyemi (1988).

Carcass evaluation

A total of 5 birds were randomly selected from each of the replicates and fasted for 8 hours prior to complete carcass evaluation according to the methods described by Ari *et al.*(2013). The selected birds from each replicates were weighed and slaughtered by cutting the jugular vein with a sharp knife. The weights of the slaughtered birds, dressed birds, and cut parts were recorded and expressed as percentage of their respective plucked weights.

Chemical analysis

Chemical compositions of each of the experimental diets were determined according to standard procedures (AOAC, 2006).

Statistical Analysis

Data collected were subjected to one-way analysis of variance (ANOVA). Means that were significantly different were separated using Duncan's Multiple Range Test in the SAS package (Duncan, 1955).

RESULTS AND DISCUSSION

The composition and determined values of the starter and finisher diets presented in Table 1 showed that the formulated starter and finisher experimental feeds meets the recommended nutritional requirements for broiler chickens (NRC 1995).

Table 1: Chemical composition of the experimental Diets

	Starter diets			Finisher diets		
Ingredients	**D1**	**D2**	**D3**	**D1**	**D2**	**D3**
Blood Meal	3.4	3.4	3.4	3.8	3.8	3.8
Bone Meal	1	1	1	0.1	0.1	0.1
DL Methionine	0.1	0.1	0.1	0.1	0.1	0.1
Fish Meal	3.15	3.15	3.15	4	4	4
Groundnut Meal	13	13	13	9.15	9.15	9.15
Lysine	0.1	0.1	0.1	0.25	0.25	0.25
Limestone	0.1	0.1	0.1	0.1	0.1	0.1
Maize	45	45	45	51	51	51
Maize Bran	4	4	4	7.5	7.5	7.5
Palm Oil	4.98	4.98	4.98	5	5	5
Premix general	0.1	0.1	0.1	0.1	0.1	0.1
Rice bran	1	1	1	1	1	1
Salt	0.1	0.1	0.1	0.1	0.1	0.1
Soybean Meal	8.97	8.97	8.97	2.8	2.8	2.8
Melon Husk Meal	15	15	15	15	15	15
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated composition						
Metabolizable Energy (Kcal/Kg ME)	3000.09	3000.09	3000.09	3100.29	3100.29	3100.29
Dry matter (DM %)	84.99	84.99	84.99	84.93	84.93	84.93
Crude Protein (CP %)	22.00	22.00	22.00	19.39	19.39	19.39
Crude Fibre (CF %)	4.36	4.36	4.36	3.88	3.88	3.88
Ether extract (EE %)	8.58	8.58	8.58	8.65	8.65	8.65
Ash (%)	1.84	1.84	1.84	1.78	1.78	1.78
Lysine (%)	1.08	1.08	1.08	1.07	1.07	1.07
Methionine (%)	0.42	0.42	0.42	0.40	0.40	0.40
Calcium (%)	0.72	0.72	0.72	0.59	0.59	0.59
Phosphorus (%)	0.47	0.47	0.47	0.39	0.39	0.39
Determined analysis (%)						
DM	92.10	92.12	91.31	91.81	92.21	92.72
CP	21.57	21.93	22.68	19.92	20.51	20.77
CF	5.76	5.62	5.47	5.47	5.45	5.34
EE	10.17	9.05	9.45	10.55	9.91	10.29
T Ash	6.67	6.20	6.52	3.40	3.94	4.12
NFE	47.93	49.32	47.19	52.47	52.40	52.2

D1 (15%) Mechanically Treated Melon Husk; D2 (15%) Soaked Melon Husk; D3 (15%) Rumen Liquor Fermented Melon Husk

*Premix to provide the following per Kg of diet: Vitamin A, 9,000 IU; Vitamin D3, 2,000,IU; vitamin E, 18 IU; vitamin B1, 1.8 mg; vitamin B2, 6.6 mg B2,; vitamin B3, 10 mg; vitamin B5, 30 mg; vitaminB6, 3.0 mg; vitamin B9, 1 mg; vitamin

Performance characteristics of birds fed the experimental diets

The effect of melon husk treatment diets on the performance of broilers is shown in Table 2. Birds on diets 3 (FMH) and 2 (SMH) had higher weight gain and better FCR than birds on diet 1 (MTMH) in the starter phase. The results are slightly different with diet 2 (SMH) having higher weight gain in the finisher phase. The values for survival percentage (%), initial body weight, final body weight and weight gain at starter phase were highly significant ($p<0.05$) in diet 3. An increase in broiler chickens fed with fermented melon husk meal with rumen liquor was recorded when compared to broilers fed with raw melon husks and soaked in water melon husks.

Table 2: Effects of melon husk treatment diet on the performance of broiler chickens

	Starter Phase				Finisher Phase			
Parameters	**D1**	**D2**	**D3**	**SEM**	**D1**	**D2**	**D3**	**SEM**
Survival (%)	95.33^{b}	92.00^{c}	100.00^{a}	1.44	81.67^{b}	87.50^{c}	99.17^{a}	2.18
Initial body weight (g)	180.13^{a}	173.40^{c}	206.80^{a}	18.58	705.83^{c}	790.00^{b}	975.42^{a}	45.16
Final body weight (g)	271.20^{b}	265.27^{c}	324.73	25.62	868.42^{c}	999.17^{b}	1211.25^{a}	51.15
Weight gain (g)	91.07^{c}	91.87^{b}	117.93^{a}	7.99	4908^{c}	7167^{a}	6108^{b}	12.36
FCR	2.28^{b}	2.28^{a}	1.54^{c}	21.89	7.50^{a}	7.50^{a}	7.50^{a}	18.89

^{abc}Means in the same column with the same superscript are not significantly (P>0.05) different;
SEM = Standard Error of Means

These results are consistent with the findings of Bolu *et al*. (2011) who reported poor FCR, weight gain for broilers fed fibrous melon based diets. Similarly, the poor performance observed for untreated melon husk based dietary group supports the work of Ogbe and George (2012) who associated higher levels of tannin in untreated melon husk, as dietary tannins are reported to negatively influence feed efficiency and weight gain of broilers. Thus, the better performance of birds fed rumen liquor fermented melon husk based diets were accounted for by increase in protein through microbial protein formation and reduction in tannin as product of rumen liquor fermentation processes as observed by Abdulrazak *et al.* (2014). The finding of Akinfemi (2010) on the increase in the crude protein content for fermented melon husk is in agreement with the results obtained from this study.

The results of carcass evaluation (Table 3) showed that average live weight, dressed weight, thigh/drumstick, wings and breast bone, were significantly ($P< 0.05$) affected by feed treatment methods. The highest average body weight (2.23 kg), dressed weight (2.03 kg), thigh/drumstick (0.60 kg), wings (0.30 kg), breast bone (0.53 kg), rib cage (0.23 kg) and back (0.33 kg) were observed in the D3 group. These results are also supported by Ogbe *et al*. (2013) who observed that treated melon husk based group have better carcass parameters values and attributed these outcome to the low levels of anti-nutrients of melon

husk (tannins, phytates, oxalates, trypsin inhibitors and saponins). Abiola *et al*. (2002) similarly reported significant variations in the carcass values of birds fed differently treated melon husk based diets.

Table 3: Effects of melon husk treated based diets on the carcass characteristics of broilers

Parameters	D1	D2	D3	SEM
Average live weight(Kg)	1.55^{c}	1.80^{b}	2.23^{a}	0.16
Dressed Weight(Kg)	1.30^{c}	1.55^{b}	2.03^{a}	0.14
Carcass Weight(Kg)	1.43^{c}	1.68^{b}	2.13^{a}	0.15
Thigh/drumstick	0.38^{b}	0.33^{c}	0.60^{a}	0.07
Wings	0.20^{b}	0.10^{c}	0.30^{a}	0.04
Breast bone	0.28^{c}	0.43^{b}	0.53^{a}	0.06
Ribs cage	0.19^{b}	0.10^{c}	0.23^{a}	0.03
Back	0.20^{b}	0.15^{c}	0.33^{a}	0.04

^{abc}Means with the same superscript in the same row are not significantly ($p>0.05$) different, SEM: Standard error of mean

The results of serum biochemistry of the broiler chickens (Table 4) indicated that the pack cell volume (PCV %) in D3 (39.00%) was significantly higher ($P< 0.05$) than D2 (36.00%) and D1 (35.00%) which were however observed to be similar. White blood cell in D2 was significantly higher ($p<0.05$) than D1 and D3 at starter and finisher phases. Haemoglobin (Hb) concentration in D3 (13.10 /dl) was significantly ($p<0.05$) higher than any other treatment, while D1 (12.60 /dl) and D2 (12.40 /dl) at both starter and finisher phase were similar. Red blood cell concentration in D1 (12.30 x 10 12/L) was significantly ($P<0.05$) higher than D2 (3.16 x 10 12/L) and D3 (4.07 x 10 12/L). Albumen in D1 (20.00 mmol/L) was significantly ($P<0.05$) higher than D2 (18.00 mmol/L) and D3 (19.00 mmol/L). Urea in D3 (3.00 mmol/l) was significantly ($P<0.05$) higher than in D1 (2.70 mmol/L) and D2 (2.40 mmol/L) which were similar. Creatinine values in D1 (42.00 mmol/L) was significantly ($P<0.05$) higher than those of D2 (41.00 mmol/L) and D3 (25.00). Calcium (Ca) in D1 (1.50 mmol/l) was also significantly ($p<0.05$) higher than D2 (1.30 mmol/L) and D3 (1.20 mmol/L), while Potassium (K^{+}) in D1 (3.1 mmol/L) was significantly ($p<0.05$) higher than others.

The hematological values obtained for birds fed experimental diets were similar to standard values of MVM (1986). However, differences observed between treatment groups are indicators of variations in rates of nutrient uptake through the portal systems of the birds and are also related to their survival percentage. It should be noted that Bolu *et al.* (2011) also reported that hematological values apply as diagnostic tools for ascertaining the health status of domestic animals.

Table 4: Effects of melon husk treatment diet on the serum biochemistry of broilers

Parameters	D1	D2	D3	SEM
PVC (%)	35.00[c]	36.00 [b]	39.00 [a]	±0.76
WBC x10/l	195.00[b]	197.00 [a]	187.00 [c]	±1.93
Hb/dl	12.60[b]	12.40 [c]	13.10 [a]	±0.13
RBC x 10 12/L	12.30[a]	3.16 [c]	4.07 [b]	±1.84
Albumen mmol/L	20.00[a]	18.00 [c]	19.00 [b]	±0.37
Globulin mmol/L	14.00 [a]	12.00 [c]	13.00 [b]	±0.37
Urea mmol/L	2.70 [b]	2.40 [c]	3.00 [a]	±0.11
Creatinine mmol/L	42.00 [a]	41.00 [b]	25.00 [c]	±3.48
Ca^{+}	1.50 [a]	1.30 [b]	1.20 [c]	±0.06
K+	3.1 [a]	2.1 [c]	2.7 [b]	±0.18

[abc]Means with the same superscript in the same row are not significantly (p>0.05) different. SEM= Standard error of mean

CONCLUSION

In conclusion, the finding of this studyindicated that melon husk can be used as feed ingredient in the diets of broiler chicken for better performance. It is recommended that melon husk should be processed by fermenting in rumen liqour prior to inclusion in the diets of broiler chickens for better utilization by the animal.

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