Response of Broiler Chickens to Alkaline Treated Melon Husk Diets and Its Economic Implications

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Abstract
The primary cause of poor livestock performance in developing countries is among other things, a seasonal inadequacy of good quality and quantity of feed available. This study investigated comparison of proximate constituents of untreated and alkaline treated melon husk and the effect of untreated and alkaline treated Melon husk diet on performance and carcass characteristics of broiler chicken (180 Anak 2000 strain). The five diets contained control diet of 0% level of inclusion of melon husk, 10% and 20% of untreated melon husk; 10% and 20% level of inclusion of Alkaline treated melon husk as replacement for maize. It could be observed that the dry matter content of 90.08% was obtained for untreated melon husk as compared to 75.50% in treated melon husk. Feed and protein intake were not significantly affected (P>0 .05) by treatment effects. The highest value of 100.69% and 21.15% for feed and protein intake were recorded in 20% level of inclusion of the treated diet while the lowest value of feed and protein intake of 81.35% and 17.09% respectively was recorded in 20% level of inclusion of untreated diet. The liver was found to be significantly affected (P<0.05) by the dietary treatment as a result of interaction of levels of inclusion and treatment while other parameter such as gizzard, the intestine, abdominal fat and caeca were not. Economically, it is cheaper to use melon husk to replace maize as the cost per kilogram of feed decreases from N42.27 in diet 1 to N 41.56 in diet5.

Keywords: Broiler Chickens, Alkaline, Melon husk, Diets, Economic

1. INTRODUCTION

Nutrition is one of the major constraints to the survival of livestock industry in Nigeria. It has been suggested in various reports that the expansion of Nigeria's commercial poultry industry holds the greatest promise for bridging the animal protein gap in the country within the shortest possible time (Babatunde 1993). Over the years, evidence has accumulated that the average Nigerian's diet is characterised by an insufficient level of animal protein intake. Oyenuga (1968) reported that an average Nigerian was not consuming enough protein and that animal protein was more important than plant protein. This is due to the scarcity and high cost of animal protein production. The problem has been exacerbated further by the poor state of the economy, which has resulted in a low standard of living. The importance of the livestock industry in the production of animal protein in the form of eggs, meat, and milk cannot be overstated; however, the projected supply of animal protein in developing countries is estimated to be less than 10% of that in developed countries (Preston and Leng, 1987). In a study on the utilisation of alkali treated melon husk by broilers, Abiola et al. (2002) found that 20% maize replacement levels resulted in increased feed intake and the best meat/bone ratio, whereas 10% maize replacement levels with MH were recommended for broilers fed untreated melon husk. This is because the productivity of producing animals is low when compared to livestock in the Western world. The primary cause of poor livestock performance in developing countries is among other things, a seasonal inadequacy of good quality and quantity of feed available. Abiola et al. (2002) fed alkali treated melon husk to broilers and recorded increased in feed intake and best meat/bone ratio at 20% maize replacement of dietary maize levels while untreated MH could not go beyond 10% level of replacement.

Apart from seasonal scarcity of feed ingredients, the direct result of the Federal Government's ban on the importation of concentrates, combined with low local production of feed ingredients and competition between man and livestock for some of the available ingredients, exacerbated the problems confronting the livestock industry. As a result of increasing human population and the resulting increased pressure on available feed resources, the range of raw materials that can be economically fed to livestock is narrowing, making feed more expensive than it should be in comparison to other inputs in livestock production. As a result, in this type of economic depression, with a scarcity of feeds and feeding stuffs, poultry production is the animal of choice; the efficiency with which poultry convert plant materials into meat and eggs, as well as their short generation intervals, not only ensure a supply of high-quality protein of animal origin, but also a quick return on investment. According to Adesida (1979), the main economic consideration is the relationship between total feed input and meat output, so the cheapest but most efficient diet must be obtained for the most profitable production. Feed has been a significant hindrance in poultry production. Despite this, the poultry industry has consistently lost promising poultry farmers on an annual basis; in fact, the poultry industry has suffered the greatest stock loss in the last ten years. The primary cause of this drastic reduction is a severe scarcity of feed at high prices, as evidenced by an increase in the price of maize per tonne, which was accompanied by an increase in the price of finished poultry feed for the same period. However, the price of eggs and poultry meat rose exorbitantly.

Contemporary studies have demonstrated the good feeding potentials of such by product like corn offal, dried brewer's grains, etc. and the utilization of crop residue such as cocoa husk (Abiola and Tewe 1990), Cowpea husk (Reddy et al. 1978), Sweet potato (Job et al. 1979; Fetuga and Oluyemi 1976) Cassava peel (Tewe & Oke 1983) and mango seed kernel (EL-Alaily et al. 1976) as a replacement for maize in livestock feed. However, there are other feed sources that are underdeveloped and underutilised, but have the potential to make a significant impact as feed stuff in animal rations, one of which is melon husk. Using crop residue that is not directly usable by humans will help to reduce costs in poultry production. One of the goals of livestock producers is to convert inedible or surplus food into animal protein therefore, there is a need to develop a simplified feed formulation that uses little or no maize as an energy source, but instead makes use of more agro-industry by-products and crop residue. The poultry industry's rapid success and expansion are thus dependent on the availability of high-quality and low-cost compounded feeds.

2. MATERIAL AND METHODS

The research was carried out at the University of Agriculture poultry/feed mill unit, Kotopo, Abeokuta, Odeda Local government of Ogun State, Nigeria. A total of 180 unsexed day-old broiler chicks were obtained from a commercial hatchery in Abeokuta and were floor brooded for a week before the commencement of the experiment (Anak 2002 strain). From day-old to 7 days of age, the birds were brooded together on deep litter floor and were fed with the control diet. At expiration of the 7days brooding period, the birds were randomly divided into 5 groups of 36 birds per treatment and 12 birds per replicate. Each group of 36 birds were fed with five (5) different experimental diet which included the Melon husk, and melon husk used was obtained from the Research Farm of University of Agriculture Abeokuta. The Husk was sun dried for 5 days and treated with alkaline. Four kilogramme of the sun dried melon Husk was burnt to ash given 1kg of Ash. 300gm of the ash was thoroughly mixed with 3kg of ground melon husk Sand soaked in 10 litres of water for 7 days. The solution was stirred thrice daily i.e. 8 hourly. At the end of the 7th day, the alkaline treated melon husk was drained to remove water and sun-dried for 5 days. The samples of the alkaline treated melon husk were taken to the laboratory for proximate analysis. Both the sun-dried alkaline treated melon husk and untreated melon husk were used to replace maize in the diet at the level 10% and 20% untreated, 10%, 20% treated. The diets were made to be Isonitrogenous and Isocaloric feeds and water were supplied ad-libitum.

Feed consumption and live weight gain of each replicate was taken on weekly basis. Thus weekly record was kept. Feed intake was calculated by subtracting feed leftover from feed supplied. Feed conversion ratio was determined by dividing feed consumption by the weight gained. At the end of the 7th week, 15 birds (3 birds per treatment) were randomly selected for carcass analysis. The birds were weighted (Live weight) individually slaughtered and eviscerated. Slaughtering was done by severing the jugular vein while evisceration was done by cutting through the abdominal region from where the internal organs were removed and weighed with a sensitive scale. The dressed weight was taken as well as weight of internal organs such as gizzard, liver and the heart, both the length and the weight of small intestine, large intestine and ceaca were also taken. Statistical analysis was done using the analysis of variance using 2 X 3 factorial arrangement model in a complete randomized design, while a computer package Minitab release 7.1 was used in the separation of significant difference among the means.

3. RESULTS

Table 1: proximate composition (%) of untreated and treated melon husk

Parameters	*Untreated	Treated
Dry matter	90.08%	75.50%
Crude protein	10.00%	9.52%
Esther extract		
Ash		
Nitrogen free extract		
Crude fibre	17.72%	29.00%

The result of the proximate composition of untreated and alkaline treated melon husk is shown in table 1. It could be observed that the dry matter content of 90.08% was obtained for untreated melon husk as compared to 75.50% in treated melon husk. However, crude protein content was found to be superior in the treated melon husk (10.00%) to that of untreated melon husk (9.52%). In addition, the treated melon husk had a higher ether extract content than the untreated melon husk. While the ash and nitrogen free extract content of treated melon husk was higher than that of untreated melon husk, the crude fibre content of the treated was reduced to 17.72% from 29.00% in the untreated melon husk.

Tables 2 and 3 show the mean values of the experimental birds' performance characteristics as influenced by inclusion level, treatment, and the interaction of two factors. It was clear that the single effect of inclusion had no significant effect on the birds' performance across all parameters observed in table 2 below. However, as the level of inclusion increased from 0% to 20%, all of the observed parameters increased correspondingly. Table 2 shows that the treatment effect increased both feed and protein intake slightly. According to table 3, the interaction of two factors revealed that the control diet had the highest daily weight gain of 33.97g/bird, while the treated diet had the lowest daily weight gain of 29.86g/bird at the 10% level of inclusion. Weight gain was found to be greater in the untreated diet than in the treated diet on average. The treated diet had the highest daily feed intake of 100.69g/bird at a level of inclusion of 20%, while the untreated diet had the lowest feed intake of 81.36g/bird at a level of inclusion of 10%. It was also discovered that the treated diet had a higher daily feed intake than the untreated diet.

However, the feed gain ratio in the untreated diet was found to be superior, with 2.55 recorded at the 10% level of inclusion compared to 3.17 recorded at the 20% level of inclusion of treated. The recorded mortality was very low and was most likely due to management error rather than experimental feeding treatments.

Table 2: Single effect of level of inclusion and treatment on performance characteristics of broiler chickens fed with untreated and alkaline treated melon husk diets

Parameters	**Effect of level inclusion Level of Inclusion (%)**				**Effect of treatment**		
	0	**10**	**20**	**SEM**	**Untreated**	**Treated**	**SEM**
Av. Initial weight (g/bird)	130.83	130.83	132.92	4.3	132.78	130.28	2.11
Av. Final weight (g/bird)	1730.60	1588.30	1640.90	23.10	1676.10	1630.10	35.30
Daily weight gain (g/bird)	33.97	30.89	32.27	0.53	32.96	31.79	0.68
Daily feed intake (g/bird)	89.68	88.43	95.15	5.46	84.88	92.29	3.51
Feed/gain intake	2.65	2.89	2.89	0.20	2.59	3.20	0.41
Daily protein intake	18.83	18.57	19.95	7.15	17.83	20.01	0.74

(g/bird)							
Protein efficiency ratio	0.39	0.35	0.36	0.02	0.39	0.34	0.02

Means in the same row are not significantly different (**P**>0.05)

Table 3: Interaction effect on performance characteristics of broiler chickens fed with untreated and alkaline treated melon husk diet

Parameters	**Untreated melon husk Level of Inclusion (%)**			**treated melon husk**			
	0	**10**	**20**	**0**	**10**	**20**	**SEM**
Av. Initial weight (g/bird)	130.83	133.61	133.89	131.60	128.05	131.95	2.26
Av. Final weight (g/bird)	1730.60	1634.80	1633.90	1730.90	1541.70	1618.00	39.30
Daily weight gain (g/bird)	33.97	31.91	32.98	33.39	29.86	31.56	0.88
Daily feed intake (g/bird)	89.68	81.36	83.61	89.90	95.50	100.69	5.63
Feed/gain intake	2.65	2.55	2.59	2.30	3.24	3.17	0.21
Daily protein intake (g/bird)	18.83	17.09	17.56	18.90	20.05	21.15	1.18
Protein efficiency ratio	0.39	0.39	0.40	0.42	0.32	0.32	0.02
Mortality (%)	1.11	0.56	1.11	1.00	2.78	4.44	0.19

Means in the same row are not significantly different (**P**>0.05)

Table 4 shows the outcome of the single effect of inclusion level and treatment on the carcass characteristics of the experimental birds at the end of the experiment. The value obtained as a result of a single effect of level of inclusion for live and dressed weight decreased as the level of inclusion increased. This factor was also found to have a significant (P<Z 0.05) effect on the values recorded for the liver and length of the large intestine. The values obtained for live weight (1733.30 percent), dressed weight (70.89 percent), gizzard (136 percent), and liver weight (2.19 percent) were found to be lower as a result of the treatment effect. There was no statistically significant difference in any of the values obtained as a result of the treatment effect. Table 5 shows that, aside from the weight of the liver, which was significantly affected (P<0.05) by the interactive effect of both treatment and level of inclusion of both untreated and treated diet. However, other parameters such as the live weight and dressed weight, as well as the weight of the gizzard, heart, small intestine, large intestine caeca, and abdominal fat, were not significantly affected.

The highest liver weight expressed as a percentage of live weight was 2.35 percent in the I0 percent level of untreated diet inclusion, while the lowest value of 1.80 percent was recorded in the 20 percent level of untreated diet inclusion. On average, the value for the liver in the treated diet is higher than in the untreated diet, as is the weight of the gizzard. The treated diet had the lowest abdominal fat (1.53%) at 20% level of inclusion, while the untreated diet had the highest abdominal fat (2.21 %) at the 10% level of inclusion.

Table 4: Single effect of level of inclusion and treatment on Carcass characteristics of broiler chicken fed with untreated and alkaline treated melon husk Diets

Parameters	**Effect of level inclusion Level of Inclusion (%)**				**Effect of treatment**		
	0	**10**	**20**	**SEM**	**Untreated**	**Treated**	**SEM**
Live weight (%)	1800.00	1733.00	1700.00	36.50	1755.60	1733.30	41.20
Dressed weight (%)	72.16	7 1.30	70.73	0.56	71.90	70.89	0.87
Gizzard (%)	2.09	1.77	1.91	0.55	1.89	1.96	0.09
Liver (%)	2.02c	2.31a	2.03b	0.03	2.04	2.19	0.09
Heart (%)	0.61	0.58	0.58	0.03	0.60	0.57	0.31
Small intestine (gm)	0.09	0.23	0.11	0.01	0.19	0.11	0.84
Large intestine (gm)	0.03	0.01	0.01	0.02	0.22	0.16	0.01
Caeca (gm)	0.09	0.10	0.07	0.08	0.07	0.06	0.05
Small intestine (%)	2.80	3.45	3.14	0.13	3.09	3.17	0.14
Large intestine (%)	0.15b	0.17ab	0.23a	0.01	0.18	0.18	0.02
Caeca (%)	0.59	0.66	0.54	0.02	0.59	0.61	0.04
Abdominal fat (%)	1.95	2.02	1.17	0.26	2.02	1.77	0.33

Means in the same row are not significantly different (**P**>0.05)

Table 5: Interaction effect on carcass characteristics of broiler chickens fed with untreated and alkaline treated melon husk diet

Parameters	**Untreated melon husk Level of Inclusion (%)**			**treated melon husk**			
	0	**10**	**20**	**0**	**10**	**20**	**SEM**
Live weight (%)	1800.0	1733.00	1733.30	1800.70	1733.30	1666.70	41.20
Dressed weight (%)	72.16	73.16	70.39	72.40	69.46	71.07	1.23
Gizzard (%)	2.09	1.76	1.81	2.20	1.78	2.00	0.09
Liver (%)	2.02d	2.35a	1.80e	0.70	2.26c	2.31b	0.09
Heart (%)	0.61	0.65	0.55	0.10	0.51	0.59	0.08
Small Intestine (gm)	0.09	0.36	0.11	0.07	0.11	0.11	0.08
Large intestine	0.03	0.01	0.03	0.04	0.01	0.01	0.02
Caeca (gm)	0.09	0.10	0.07	0.08	0.07	0.06	0.05
Small intestine (%)	2.80	3.49	3.01	2.88	3.45	3.26	0.16
Large intestine (%)	0.15	0.15	0.25	0.24	0.19	0.20	0.02
Caeca (%)	0.59	0.66	0.50	0.65	0.66	0.58	0.04
Abdominal fat (%)	1.95	2.21	1.89	1.97	1.83	1.53	0.23

a.b,c means in the same row with different superscripts differ significantly ($P<0.05$)

3.1 Cost analysis of the diet

The economic benefit of feeding broiler chicken with a diet in which maize was partially replaced with melon husk was shown in table 5. The result reveals that the cost of feed per kilograms decreases from ₦ 44.20 in the control diet to N 41.56 in the 20% level of inclusion diet (diets 1 and 5 respectively). The cost of feed per weight gain fell in line with this trend. Despite the fact that the cost of feed per kilogramme was the same in both the treated and untreated diets, the cost of feed per weight gain appeared to be lower in the untreated diet, as shown in the table.

4. DISCUSSION

The results of the analysis of the untreated and treated melon husk are shown in Table 1. The dry matter content of untreated melon husk was 90.08 %, which was higher than the treated diet's dry matter content of 75.50 %. The crude protein content of the treated melon husk was found to be 10%, which was higher than the 9.52 % found in the untreated melon husk. The treated melon husk ether extract content of 18.20 was also found to be higher than the untreated diet ether extract content of 17.75. The ash and nitrogen free extracts followed the same trend as the ether extract, with the higher ash content observed in the treated melon husk possibly due to the effect of the ash used in treatment.

The results also revealed that the fibre content of the alkaline-treated melon husk was lower than that of the untreated melon husk. Sundstol and Coxwarth (1984) reported that alkaline treatment of crop residue is very effective at reducing the fibre content of the residue. In this study, the treatment and the level of inclusion of the test ingredient had no significant effect on the final live weight of the experimental birds, as well as the daily weight gain per bird, indicating somewhat equal gain. However, feed intake was higher in the treated diet than in the untreated diet, indicating that the treated diet was consumed more by the bird than the untreated diet. The carcass characteristic of broiler chickens fed with Alkaline treated melon husk diet is presented in Table 5 and 6. The statistical analysis revealed that only the weight of the liver expressed as a percentage of live weight was found to be significantly affected by the diet. The gizzard weight, heart, small intestine, large intestine, caeca and weight of abdominal fat were found not to be significantly affected. However, the length of the small intestine was longer in the untreated diet than the treated diet. The result confirmed the report of Abdelsamie, (1983) which stated that higher fibre in the diet resulted in increasing the length of the intestine. The dressed weight ranges from 72.16% in controlled diet to 69.46% in the treated diet with the controlled diet having the highest dressed weight. The live weight the untreated diet and the treated diet were found to be almost the same as well as the value obtained for abdominal fats of both diets. The result is in line with the report of Taiwo, (1981) that high level fibre in the diet has led to reduction in the fatness of the carcass and that live weight was not affected.

5. CONCLUSION

The cost of conventional and one of the major sources of energy that is maize in poultry industry is becoming ridiculously high. This is also coupled with high competition that existed between men and livestock for these products. Hence, the need to explore other alternative source of energy like melon husk to replace maize that will raise poultry production level equal to their intrinsic genetic potentials. From this study, it has been shown that Alkaline treated melon husk can be used to replace maize up to 20% level of inclusion without adverse effect on performance and carcass characteristic of the birds. Performance in terms of feed intake and weight gain has been excellent compared to control diet where melon husk is not treated. It is also observed that the effect of treatment greatly increases the feed intake in the birds.

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