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Evaluation of Blood-Vegetable Waste Meal Fed with or Without Grit to Broilers

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Abstract

A total of one hundred and eighty (180) day old broiler chicks were used to evaluate the effect of blood vegetable waste meal with or without grit supplementation on the performance of broilers. The diets formulated had three inclusion levels of BVWM at 0, 7.5, and 15%, fed with two supplementation levels (with or without grit). The experimental animals were randomly distributed into six (6) dietary treatments. There were three replicates per treatment and ten (10) birds per replicate. Feed and water were provided *ad-libitum* while standard poultry managements were strictly followed during the study. Data on different performance such as average daily fee intake, average daily weight gain and feed conversion ratio. It was a 3X2 factorial experiment in a Completely Randomized Design (CRD). The experiment lasted for a period of 8 weeks. The result showed that the experimental diet had significant effect on the final weight gain, daily feed intake, weight gain, feed conversion ratio, cost of feed per kg and profitability. The interaction between the varying level of supplementation and no supplementation had significant effect ($P < 0.05$) on feed to gain ratio, but showed no significant difference in final weight, daily feed intake. This study shows that broilers fed 15% inclusion level of blood vegetable waste meal supplemented with grit at 5% had better performance when compared to 0% and 5% inclusion.

Introduction

In comparison with beef, mutton and pork, broiler meat consumption has shown an increasing trend across the globe mainly due to affordable prices and high availability. In addition, its consumption has no religious bindings as, in particularly, in the case of beef (Hindus) and pork (Muslims) and has an overall acceptable nutritional profile and taste. Many Nigerians consume less than 10 grams of animal protein daily as against the minimum requirement of 54 g/person/day considered consistent with a balance diet (FAO, 2007). Broiler production represent one of the most economic and easiest means of bridging the supply demand gab of animal protein, due to their rapid growth rate and superior feed conversion ratio.

Feed alone accounts for over 75% of the total cost incurred in poultry production, out of which 50% is expended to protein and energy sources (Ahaotu *et al*., 2012). This is due to the high cost of feedstuffs used in making their feed especially when feeding with conventional feed. The feedstuffs or feed ingredients used for feed formulation is expensive because they are majorly products which are consumable by humans hence causing a form of competition between humans and these birds for this feed ingredients [1].

In order to meet the increasing worldwide demand for poultry and maintain its profitability, it is important to find new ways to stay competitive within the industry and decrease the cost of production as much as possible while achieving a high quality for consumers. Conventional protein feedstuffs such as soybean meal, groundnut cake, and fish meal are quite expensive and have contributed to the poor performance or productivity of broilers and have led to the shortage in the availability of animal protein to the citizenry (Adeniji and Jimoh, 2007). Efforts to reduce the high cost of feeds and therefore the cost of poultry products have concentrated on the use of

cheaper and locally available alternative agro products especially those that have no nutritional value to mankind (Onu, 2007; Onu and Otuoyrma 2008; Oladunjoye and Ojebiyi, 2010) [10] If properly harnessed and processed, such non-conventional feed sources could be vegetable waste, blood, rumen content which is a waste material from abattoir and slaughter houses. Sundried rumen content, a potential alternative feed source obtained from the rumen of ruminant and consists of fermented and non-fermented dietary feed that passes various stages of digestion in the rumen (Adeniji and balogun, 2002) [2]. One of such ingredients is the blood vegetable waste meal. Which is obtained from processed blood and vegetable; byproducts of abattoirs and discarded vegetables like *Amaranthus cruentus* which are both waste and are not in competition with man's dietary needs [3].

Vegetable waste is usually considered as rich source of minerals (Omenka & Anyasor, 2010). Green vegetable leaves are the cheapest and most abundant source of protein because of their ability to synthesize amino acid from a wide range of available primary materials such as water, carbon dioxide and atmospheric nitrogen; as in legumes (Liener, 1969; Nwokolo and Bragg, 1977; Lewis and Fenwick, 1987). Additionally, vegetables are rich nutrient sources, potentially good for supplying essential amino acids, minerals and antioxidants to the birds, comparatively inexpensive, easily available, easy to process and pose less risk of disease contamination (Omenka & Anyasor, 2010). *Amaranthus cruentus* is species of vegetable that is produced abundantly in most African counties (Adeniji, 2012). Its leaves are a common edible vegetable consumed either fresh, or after storage using preservation techniques by canning, freezing, or dehydration. It may be eaten cooked or raw, and the taste differs considerably; the high oxalate content may be reduced by steaming. Discarded *Amaranthus cruentus* is a form of vegetable that cannot be consumed by humans and are ready for disposal after 48 hrs of being harvested (Adeniji, 2012) [4].

Nigeria has not been able to provide animal protein in sufficient quantity to meet the requirements of the citizenry. Many Nigerians consume less than 10 grams of animal protein daily as against the minimum requirement of 54 g/person/day considered consistent with a balance diet (FAO, 2007) [5].

The expensive nature of this conventional feed is due to the high cost of feedstuffs used in making them. The feedstuffs or feed ingredients used for feed formulation are expensive because they are majorly products which are consumable by humans. Efforts to reduce the high cost of feeds and therefore the cost of poultry products have concentrated on the use of cheaper and locally available alternative agro-by products especially those that have no nutritional value to mankind (Onu, 2007.; Onu and Otuma, 2008.; Okonkwo *et al*., 2008.; Oladunjoye and Ojebiyi, 2010) [6]. In other to combat this ugly situation, alternative way of feeding with less expensive and non-conventional feed like Blood Vegetable Waste Meal (BVWM) therefore becomes a necessity. One of such feed ingredients is blood vegetable waste meal (BVWM), waste products from abattoirs and vegetables like *Amaranthus cruentus* from the vegetable market, which are not in competition with man's dietary needs. Blood vegetable waste meal (BVWM) is obtained from processed blood and vegetable; both are waste. The blood used to be washed away at the abattoir, while the unsold vegetable is discarded at refuse site. Hence, BVWM is obtained almost free of charge. Furthermore the need to maximize the economic and environmental benefits in disposal of slaughter house by-products (NAVN,1994; Aniebo *et al* 2009). This study was conducted to evaluate the effects of different levels of blood vegetable waste meal, with and without grit supplementation on body weight gain, feed to gain ratio and feed intake of broilers.

Thus the objective of this study is to determine the effect of blood-vegetable waste meal on the growth performance of broilers.

Materials and Methods

Experimental Site

This experiment was carried out at the poultry unit of the university of Abuja teaching and research farm which is located along airport road, gwagwalada FCT-Abuja. gwagwalada falls within latitude $9^0$4'N, longitude $7^0$28'E,1500mm (59.1in) [7] rainfall annually, temperature ranges between 18.45°C (65.21°f), and relative humidity of 67% at 0900GMT (present).

Experimental Material and Housing

A total of One hundred and eighty day old broiler chicks (180) was used, such that there are 6 diets with 3 replicates and 10 birds per replicate. A total of 18 cages of a battery cage system was used and all the chicks were randomly allocated to the cages. This study lasted for a period of eight weeks (8 weeks), and the birds were obtained from a reputable commercial farm in Ibadan.

Source and Processing of Blood Vegetable Waste Meal (BVWM)

Discarded Amaranthus cruentus was collected from gwagwalada market in large quantity. Fresh bovine blood was collected from gwagwalada abattoir at the time of slaughter. Other feed ingredients such as maize, groundnut cake, bone meal, common salt, vit premix, grit, lysine and methionine, was purchased from a reputable feed mill within Abuja.

The collected *Amaranthus cruentus* waste was sorted to remove dirty and the leaves was separated from the stem it was mixed with the fresh blood collected at a ratio of 1:2 [8] respectively (One of vegetable and two of blood). The mixture was boiled in a wide pan for about two hours (2hrs) with constant staring to boil evenly and avoid burning. After heating, the blood vegetable waste meal was then sun dried to reduce moisture content below 10% after which it was ground to powdery substance which was incorporated into the experimental diets.

Experimental Diets and feeding

A total of Six (6) experimental diets were formulated in which BVWM was fed at graded levels 0, 7.5 and 15% and with and without grit using the model of 3X2 factorial design of Completely Randomized Design (steel and torrie,1980).

Data collection and analysis

The initial live weight and final live weight of the birds was collected at the beginning and end of the experiment respectively, weekly body weight gain was calculated as a difference in the weight of the birds from the preceding week, and daily feed intake was recorded as a difference between feed given and feed leftover. Feed to gain ratio was calculated by dividing the average feed intake by the average weight gain. Proximate analysis of the six dietary treatments was carried out, using the method described by Association of Official and Analytical Chemists (AOAC, 1990) [9]. Data collected were subjected to analysis of variance according to the method of Steel and Torrie (1980). Differences were considered to be significant at $P<0.05$ and the significant differences between means were separated using Duncan's new multiple range test.

$$\text{Feed to gain ratio} = \frac{\text{Feed intake}}{\text{Body weight gain}}$$

$$\text{Percentage Retention} = \frac{\text{Nutrient intake} - \text{Nutrient output}}{\text{Nutrient intake}} \times 100$$

Ingredients	***0% BVWM***		***7.5% BVWM***		***15% BVWM***	
	T1	T2	T3	T4	T5	T6
BVWM	0	0	7.5	7.5	15	15
GRIT	0	5	0	5	0	5
MAIZE	45	45	50	48.5	55	54
GNC	35	36	20	25	10	11
WHEATOFFAL	10.5	4.5	13	4.5	10.5	5.5
FISH MEAL	2.5	2.5	2.5	2.5	2.5	2.5
BONE MEAL	2.5	2. 5	2.5	2.5	2.5	2.5
LIME STONE	3.5	3.5	3.5	3.5	3.5	3.5
SALT	0.35	0.35	0.35	0.35	0.35	0.35
VIT.PREMIX	0.25	0.25	0.25	0.25	0.25	0.25
METHIONINE	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
ANTI-TOXIN	0.1	0.1	0.1	0.1	0.1	0.1
TOTAL	***100***	***100***	***100***	***100***	***100***	***100***
Analyzed values						
Moisture	11.51	11.43	11.45	11.33	11.44	11.50
CP	23.75	23.12	23.23	23.82	23.27	23.53
CF	3.14	2.60	3.58	2.80	3.67	3.04
M E	2737.65	2651.85	2720.14	2641.68	2741.14	2639.7
Ash	6.50	6.65	6.54	6.35	6.64	6.52
EE	5.14	5.05	4.20	4.34	3.56	3.46

*****Premix used contained the following per Kg: Vit. A, 7200 mg; Vit. D, 1600mg; Vit. E, 14400mg; Menadion, 800 mg; Thiamine, 720 mg; Riboflavin, 2640 mg; 2 3 Niacin, 12000 mg; Pyridoxin, 1200 mg; Vit B12, 6 mg; D-Pantothenic acid ,4000 mg; Folic acid, 400 mg; Biotin ,40 mg; Choline chloride, 100000mg; Antioxidant, 40000 mg. Supplied per Kg: Manganese, 40000 mg; Zinc ,33880 mg; Iron, 20000 mg; Copper, 4000 mg; Iodine, 400 mg; Choline chloride, 3 100000 mg.

Table 1: Composition of experimental diet (kg/100kg).

Results

Growth performance of broilers fed blood-vegetable waste meal with or without grit supplementation are presented in Table 2. There was no significant effect (P >0.05) on the initial weight of the broilers. There was significant effect (P>0.05) of blood vegetable waste meal fed on the obtained final weight values. The highest final weight values was obtained in the birds fed with diets 15% level of BVWM inclusion which was significantly higher(P>0.05%) than that obtained at 0% BVWM inclusion level and significantly higher than birds fed 7.5% BVWM level of inclusion. There was significant effect (P>0.05) of supplement on the final weight values, birds on grit supplementation recorded the highest final weights. The feed intake significantly increased (P>0.05), the highest feed [11] intake was recorded in the diets with 15% BVWM inclusion while the least feed intake was recorded in the diets with 0% BVWM inclusion there was no significant effect of supplement grit and no grit interaction on the daily feed intake values. There was significant effect (P>0.05) of treatment fed on the weight gain values. The highest weight gain was obtained in the birds fed with diets 15% level of

BVWM inclusion which was significantly higher(P>0.05%) than birds fed at 0% BVWM inclusion level and significantly higher than birds fed 7.5% BVWM level of inclusion. There was a significant effect (P<0.05) of treatment on the feed to gain ratio. Which indicated that feed to gain ratio improved with the addition of BVWM in the diet. There was significant increase in feed utilization as level of BWVM increases from 0% inclusion, although feed conversion ratio at 7.5% and 15% inclusion did not differ significantly as the values were comparable.

There was significant effect (P>0.05) of supplement on the weight gain values, grit supplementation had significantly higher weight gain values. The feed was best utilized by birds fed with grit inclusion with a feed to gain ratio of 2.59 and the poorest feed to gain ratio of 2.92 was obtained in birds fed with no supplement. The efficiency of feed utilization was significantly affected (P<0.05) by the interaction between BVWM and supplements.

Levels of BVWM %	***Initial weight (g)***	***Final weight (g)***	***Daily feed intake (g)***	***Weight gain (g)***	***Feed to gain ratio***
0	44.00	1429.17^{c}	70.81^{c}	24.74^{c}	2.9^{a}
7.5	44.08	1590.83^{b}	73.79^{b}	27.63^{b}	2.68^{b}
15	44.08	1734.67^{a}	78.84^{a}	30.19^{a}	2.62^{b}
SEM	0.08	48.38	1.19	0.86	0.05
SIG	NS	*	*	*	*
SUPPLEMENT					
NO GRIT	44.06	1466.11	70.11	25.39^{b}	2.92^{a}
GRIT	44.14	1581	69.80	27.44^{a}	2.59^{b}
SEM	0.007	46.28	0.34	0.83	0.10
SIG	NS	*	NS	*	*
Interaction	NS	*	*	*	*

Treatment means with different subscript along the same column are significantly different (p<0.05). BVWM - Blood Vegetable waste meal NS – not significantly different SEM- Standard error of mean. SIG – Significance

***Table 2*:** Growth performance characteristics of broilers fed blood vegetable waste meal with or without grit supplementation.

Discussion

Blood vegetable waste meal was analysed to contain 71.22% crude protein which is higher than the crude protein value for most conventional feedstuffs except for fish meal 65 or 72% and blood meal 80%. This is also supported by reports of Omenka and Anyasor 2010. This implies that when the feed stuff is not utilized and discarded such a high amount of crude protein will be wasted. There was significant effect of treatment (P>0.05) on the daily feed intake values. The observable increase in the feed intake of the birds as the inclusion level increases from 0% to 15% shows that the feed was acceptable to the birds. The results showed an increase in feed intake in birds fed blood vegetable waste meal throughout the experimental period. The increased feed intake of the birds on the diets containing blood vegetable waste meal is because it contains fiber which tends to increase the total fiber content of the diet. This result agree with Esonu *et al* 2006 and Adeniji (2013) [12] who reported a comparable increase in feed intake as the level of inclusion of BVWM increases.

Birds fed BVWM diet performed better than the control group. The increased weight gain as the level of BVWM increased in the diet agrees with the report of Esonu *et al* 2006 and Adeniji (2013) who reported a comparable increase in weight gain as the level of inclusion of BVWM increases. The improved performance could be attributed to higher protein content.

There was significant increase in feed utilization as level of BWVM increases from 0% inclusion to 15%. This indicates that feed to gain ratio improved with the addition of BVWM in the diet, this we can say occurred as a result of the increased weight gain as the inclusion of BVWM increased in the diets. This agrees with the results of Adeniji (2013) who recorded a comparable decrease in feed to gain ratio as the level of BVWN increased. The results of this experiment reports that grit inclusion at 5% in their diet affect the growth performance of broilers is in line with previous reports of (Kriz et al.,1981; Lazar et al., 1984; Kriz, 1985; Taylor, 1996; Jones and Taylor, 1999; Silva-junior et al., 2003) that growth performance was affected by inclusion of grit into broiler diet.

Birds fed grit at 5% had the highest final weight of 1561g, birds fed grit diet had a significant improved feed to gain ratio of 2.59 compared to feed to gain ratio value of no grit 2.92, this implies that grit inclusion at 5% aided effective feed utilization and made more nutrients available to the birds. Birds fed blood vegetable waste meal supplemented with grit observed higher growth performance this is because grit abrasion of the feed particles also breaks the fibrous materials into small bits for enzymatic actions Atteh and Dare (2000) reported similar results that increasing grit level allows for efficient utilization of rice bran (Although at 10%) diet by broiler finisher. the increase in the weight gain of the bird due to the inclusion of grit conforms with that report by Adeniji and Oyeleke (2008).

Conclusion

The experiment was designed to investigate the effects of graded level of blood vegetable waste meal on the performance characteristics of broilers. The result shows that better performance was obtained with those that fed on 15% BVWM and supplemented with grits, this could be probably that grit, which is expected to be grinding feed in gizzard, is actually grinding very fast, the feed quickly passed to the GIT, the crop always empty and the chicken hungry stimulating more and increased feed intake leading to higher nutrient absorption and translate to weight gain. Based on these results it could be recommended that the inclusion of BVWM as a feed ingredient in broiler diets up to 15% inclusion level with grit inclusion to be recommended since its enhanced production and helps control environmental pollution and hazards that occur from inadequate waste disposal in abattoirs. Rumen content as well as bovine blood are abattoir bye-products which if not properly handled can cause nuisance in the environment. With the present advocacy to reduce greenhouse gases which has been impacting on the environment negatively, any efforts made at reducing them in the environment we reduce the effects on climate change. According to Adeniji and Balogun 2001, 2002; Mann 1984 and Dairo 2005; the composition and potentials of Rumen content and blood qualifies them as good sources of protein for monogastric animals. Their availability all year round is confirmed by the reports of Adeniji (1996) that Rumen content and bovine blood origin is about 9634 metric tons per annum in Nigeria. The inclusion of BVWM and grit inclusion in broiler diets has no adverse effect on the growth performance of broiler. Therefore BVWM can be used up to 15% as a cheap source of protein with reduced feed cost and environmental pollution.

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