



Performance of Broiler Chickens fed Graded Levels of *Hibiscus sabdariffa* Seed Meal as a Source of Methionine

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Abstract

One hundred and fifty (150) broilers chicks at 14 days of age were used in a six (6) weeks feeding trial to determine the effect of feeding graded levels of *Hibiscus sabdariffa* Seed Meal (HSSM) as a natural source of methionine on performance of broiler chickens. Five broiler starter and finisher diets each were formulated. Diet 1 was the control and contained the DL – methionine, while Diet 2, 3, 4 and 5 contained 2.5%, 5.0%, 7.5% and 10.0% *Hibiscus sabdariffa* Seed Meal (HSSM), respectively. The birds were randomly allocated to the five treatment diets in a completely randomized design (CRD). The results showed that final weight, body weight gain, daily weight gain, total feed intake and feed conversion ratio in the starter phase were significantly ($P < 0.05$) different across the treatment groups. In the finisher phase, only initial weight, total feed intake and daily feed intake were significantly ($P < 0.05$) affected by the treatment, while final body weight, body weight gain, daily body weight gain and feed conversion ratio were not. Cost of feeding/kg and total cost of feed consumed per bird were least in T1 (#131.00) and highest in T5 (#231.00). Feed cost/kg gain was highest in T5 (#700.30) but least in T1 (#330.67), while total weight gain/kg was highest in T1 (1.24kg), followed by T4 (1.08). This study indicated that replacement of DL – methionine with 2.5% HSSM could result in higher profit margin for poultry farmers. It is therefore recommended that *Hibiscus sabdariffa* seed meal be used as a natural source of methionine to replace synthetic methionine at 2.5% level in the diet of broiler chickens.

Key words: Performance Assessment, Broiler chickens, Hibiscus seeds

Introduction

Methionine is an essential amino acid needed for healthy and productive poultry. It is commonly supplemented as DL – methionine in animal feeds, which acts as a lipotropic agent and plays important roles as a methyl donor, and in choline, betaine, folic acid and vitamin B metabolism (Igbasan et al 2012). Methionine is usually the first limiting essential amino acid in poultry nutrition (Kim et al, 2006). It plays critical roles in protein synthesis within the avian species body, including those involved in the formation of feathers, organs and muscle (Fanatico 2010). Broiler chickens not supplemented with required dietary methionine have been found to exhibit decrease feed intake, feed conversion ratio (FCR), uniformity, gain and increased thigh, wing, and fat pad percentage (Carew et al,

2003). Methionine is also involved in immune response, as increased dietary methionine improved antibody production in broilers (Rao et al, 2003). the search for natural source of methionine has remain central focus of animal nutritionists (Dafwang and Damang, 1995). All aimed at reducing the cost of livestock production through the use of cheaper feeds. Hibiscus was chosen to be a good source of methionine because it gave the best result out of the four test materials (moringa seed meal, Jatropha seed meal and Cashew nut seed meal). The seed of roselle is a valuable food resources on account of its protein, calorie, fat and also substantial account of fibre and valuable micro-nutrients (Akanbi et al; 2009). The seed are subjected to a solid-state fermentation process to produces a meat substitute condiment called “furudu” in

Sudan (Yaquob et al., 2004). In this result, it is higher than any test seeds in final weight, body weight gain, Average daily weight gain and average daily feed intake. The range of protein content in sorrel seeds (27.2%) was higher to values obtained in conventional legume protein seed source such as cowpea (21 to 23%) Nzikou et al, (2011)

Materials and Methods

Site of Experiment.

The research was conducted at the Teaching and Research Farm of the Department of Animal Science and Range Management, Modibbo Adama University of Technology, Yola located in Girei Local Government Area. Girei is located in the Guinea Savannah Zone of Nigeria and lies between Latitude 90 and 11°N of the Equator and Longitude 110 and 14°E of the Greenwich Meridian. Adamawa State Shares its boundaries with Taraba State to the South and West, Gombe State to the north-west and Borno State to the north. The state has a tropical climate with distinct dry and wet seasons. The rainfall begins in April and ends in late October, while the dry season commence in October or November and ends the following April. It has annual rainfall of about 700mm-1600mm and an average minimum and maximum temperature of 18-40°C and relative humidity of 20-50%. Adamawa State has an international boundary with the Cameroun Republic along its eastern border (Adebayo and Tukur, 1999)

The experiment was conducted for a period of six (6) weeks at the Poultry Unit of the Department of Animal Science, Modibbo Adama University, Yola, Adamawa State, Nigeria. The poultry building is an open side type that permits adequate ventilation in the house with a concrete floor and zinc-roofing sheet well electrified.

Experimental Birds and Diets

One hundred and Fifty (150) healthy chicks at 14 days of age were randomly allocated to five treatments in a group of 30 birds

replicated with 10 birds per each placed on deep litter. The chicks were protected against, Newcastle and infectious Bursal Diseases by routine vaccination. The experimental group were T1 (0%) Control diet without Alternative Sources of Methionine (ASM) supplementation, T2 (2.5%)-Diet with ASM, T3 (5.0%) - Diet with ASM, T4 (7.5%) – Diet with ASM and T5 (10.0%)-Diet with ASM. All the five feeds and clean drinking water were given (*ad libitum*). Measured quantity of feed was fed to chicks every day and the leftover feed was recorded after 24 hrs. Mean body weight (gm/chick/week) was recorded at weekly intervals from second week to six weeks of the study. The feed conversion ratio (FCR) was calculated by dividing feed intake by weight gain. At the end of the experiment, two birds of average body weight from each replicate were randomly selected and slaughter.

To determine the carcass characteristics and eight of visceral organs, blood samples were collected during slaughtering using anticoagulant for serum separation. Data collected were analysed by using the analysis of variance techniques in a 3x2 factorial arrangement under CRD. Means of all parameters were separated by using turkey's test with the assistance of software (SPSS version 16).

Economic Analysis

The considered economic parameter was determined using the prevailing market prices of the feed stuff at the time the experiment diets were formulated, costs of medication and that of broilers on the live weight basis.

Result and Discussion

The result of the effect of alternative sources of methionine as a substitute for synthetic methionine on growth performance of broiler starter chick (2-4 weeks) and broiler finisher (5-8 weeks) were presented in Tables 3 and 4, respectively. The result showed that body weight gain, average feed intake and FCR

during starter phase were significantly ($P < 0.05$) different across the treatment groups. The body weight of birds fed graded level of legume seed methionine (HSSM) was significantly ($P < 0.05$) highest when compared with the other control group. Also the group supplemented with synthetic methionine and seed methionine had significantly higher body weight than the control group as indicated in T4 (568.47 g) and T1 (739.40 g) in this study. The observed increase in body weight and weight gain of chicks with methionine supplementation is similar to the findings of Chattopadhyay *et al.* (2006) Kalbande *et al.* (2009) and Kadam *et al.* (2009). The increase in body weight and weight gain is attributed to the potential role of methionine in promoting growth. Kalbande *et al.* (2009) and Narayanswamy and Bhagwat (2010) reported that the live body weight gain of birds at 21 days increase significantly with supplementation with semi-synthetic methionine in the diets of broiler chicken.

In the finisher phase body weight gain, final weight and feed conversion ratio were not significantly ($P > 0.05$) different across the treatment groups. Absence of significant ($P > 0.05$) difference in the above mentioned parameters is in line with the works of Kaur *et al.* (2013), Egenuka *et al.* (2015), Ahmed and Abass (2015) and Kalbande *et al.* (2009)

who supplemented diets of broilers with different levels of methionine, Bouyeh (2012) who tested excess lysine and methionine on the immune system and performance of broiler. Absence of significant difference in the above parameters may be caused by the similarity of the metabolizable energy concentration of the diets since birds eat to satisfy their energy requirement (Onu *et al.*, 2010). The use of DL-Methionine in organic feed for increasing growth rather than the health of the birds has been criticized by the National Standard Board of USA. The inclusion of DL-methionine in organic poultry is restricted 5lbs/ton of feed for broilers in the USA (USDA, 2011). Further, synthetic methionine is produced chemically from acrolein, methyl mercaptan, and hydrogen cyanide Figge *et al.*, 2010), and the risk of chemical residues and the increasing prices of petrol derived precursors are pressing for organic sources of methionine (Hadinia *et al.*, 2014). As the complete replacement of synthetic methionine is not possible, therefore assist gradual replacement with natural methionine provides an opportunity for decreasing its use in poultry diet. Hence the present study was undertaken to evaluate the effect of partial replacement of synthetic methionine with natural methionine replacers upon the growth and performance of broiler chicken.

Table 1. Proximate composition of Experimental Broiler chicken starter diet fed graded levels of Hibiscus seed meal as source of ASM

Nutrients	T1	T2	T3	T4	T5
Dry matter (%)	89.99	89.59	89.48	89.30	89.35
Moisture	10.01	10.41	10.52	10.70	10.65
Crude protein (%)	21.20	20.40	20.50	20.70	20.10
Crude fibre (%)	3.30	3.09	3.54	3.67	3.45
Ether Extract (%)	4.01	4.35	4.15	4.10	4.00
Nitrogen Free Extract (%)	49.20	46.30	46.70	47.90	47.80
Ash (%)	5.01	5.24	5.00	5.84	5.43
ME (kcal/kg)	2855.81	2750.80	2752.50	2798.45	2764.60

Table 2. Proximate composition of Experimental Broiler chicken finisher diets fed Graded levels of Hibiscus seed meal as sources of ASM

Nutrients	T1	T2	T3	T4	T5
Dry matter (%)	90.68	90.58	90.39	90.44	90.75
Moisture	9.32	9.42	9.61	9.56	9.25
Crude protein (%)	20.70	19.60	19.61	19.80	19.70
Crude fibre (%)	3.40	3.60	4.10	4.30	4.50
Ether Extract (%)	4.23	4.80	4.45	4.60	4.70
Nitrogen Free Extract (%)	57.50	55.90	56.40	54.90	53.65
Ash (%)	4.90	5.20	4.43	5.49	5.18
ME (kcal/kg)	3149.78	3098.45	3088.22	3025.40	3014.18

Table 3. Performance Assessment of Broiler starter phase (2-4 weeks) fed graded level of Hibiscus seed meal as sources of ASM.

Parameters	T1 (0%)	T2 (2.5%)	T3 (5.0%)	T4 (7.5%)	T5 (10.08)	SEM
Initial wt (g)	233.30	257.67	238.77	258.37	233.93	11.49 ^{NS}
Final wt (g)	739.40 ^a	504.23 ^{bc}	402.13 ^c	568.47 ^b	528.20 ^b	38.72 [*]
Wt gain (g)	506.10 ^a	246.57 ^{cd}	230.03 ^d	310.10 ^b	294.27 ^{bc}	16.90 [*]
Daily wt gain (g)	36.13 ^a	17.60 ^{cd}	16.43 ^d	22.14 ^d	21.00 ^{bc}	38.03 [*]
Total feed intake (g)	820.87 ^a	497.17 ^b	374.23 ^b	597.03 ^b	543.93 ^b	60.11 [*]
Daily feed intake kg	58.63 ^a	35.53 ^b	35.33 ^c	42.63 ^b	38.87 ^{bc}	1.99 [*]
FCR	1.63 ^c	2.03 ^{ab}	2.17 ^a	1.93 ^b	1.87 ^b	0.06 [*]
Mortality	-	-	-	-	-	-

a,b,c= means on the same row with different superscripts are significantly different (P<0.05) * = Significant NS = Not significant
 ASM = Alternative sources of methionine wt = weight SEM = Standard Error of mean FCR = Feed conversion ratio
 HSSM=*Hibiscus sabdariffa* seed meal

Table 4. Performance Assessment of Broiler finisher phase (5-8 weeks) fed graded level of Hibiscus seed meal as Sources of methionine (ASM).

Parameter	T1 (0%)	T2 (2.5%)	T3 (5.0%)	T4 (7.5%)	T5 (10.08)	SEM
Initial wt (g)	739.40 ^a	504.23 ^{bc}	468.80 ^c	568.47 ^b	528.20 ^{bc}	25.76 [*]
Final wt (g)	1474.00	1162.00	1101.70	1336.7	1187.00	109.08 ^{NS}
Wt gain (g)	734.60	657.77	632.87	768.20	658.80	97.34 ^{NS}
Daily wt gain (g)	26.23	23.50	22.60	27.43	23.57	3.48 ^{NS}
Total feed intake (g)	2303.90 ^{ab}	1995.00 ^b	1997.10 ^b	2367.10 ^a	2335.30 ^a	94.63 [*]
Daily feed intake kg	82.27 ^{ab}	71.27 ^b	71.33 ^b	84.53 ^a	83.40 ^a	3.38 [*]
FCR	3.23	3.07	3.27	3.20	3.63	14.31 ^{NS}
Mortality	-	2	3	-	1	

a,b,c= means on the same row with different superscripts are significantly different (P<0.05) * = Significant
 NS = Not significant
 ASM = Alternative sources of methionine
 wt = weight
 SEM = Standard Error of mean
 FCR = Feed conversion ratio

Table 5: Economics of Production of broiler chicken feed ASM as replacement level of synthetic methionine.

Parameters	Diet/ Treatment				
	T1 (%)	T2 (2.5%)	T3 (2.5%)	T4 (2.5%)	T5 (2.5%)
TFI (kg/birds)	3.04	2.48	1.56	3.13	2.91
Feed cost (N/kg)	131.00	206.00	156.00	156.00	218.50
Cost of total feed intake (kg)	398.24	510.88	243.36	488.28	635.84
Total weight gain (kg)	1.56	1.29	1.10	1.77	1.28
Feed cost/kg (N gain)	255.28	396.03	221.24	275.86	496.75

ASM= alternative sources of methionine IT= 0% of the test diet T2= 2.5 % of *Moringa oleifera* seed meal + diet
T3= 2.5%of boiled jatropha seed meal + diet T4= 2.5 % of *Hibiscus sabdariffa* seed meal + diet T5=2.5% of cashew nut seed + diet

Conclusion

From the result of this study, it is concluded that poultry farmers should use plants such as *Hibiscus sabdariffa* which contained high amount of methionine to prepare natural methionine that will replace synthetic methionine in their animal diets. The study recommends that 2.5% of *Hibiscus sabdariffa* seed meal of natural sources of methionine can replace synthetic methionine in the diet of broiler chickens.

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