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Growth performance and blood profile of broiler chicken fed four (4) different alternative sources of methionine

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Abstract

One hundred and fifty day old broiler chicks were used in 56 days feeding trial to determine the effect of four different types of natural sources of methionine on performance of broiler chicken. Five broiler starter and finisher diets were formulated such that Diet 1 was the control and contained the DL – methionine, while Diet 2, 3, 4 and 5 contained 2.5% Moringa oleifera seed (MOS), Boiled Jatropha seed (BJS), Hibiscus sabdariffa seed (HSS) and Cashew nut seed (CNS) respectively. The birds were randomly allotted to the five diets in a completely randomized design. Each treatment comprised of three replicates of ten (10) birds per replicates. Performance, blood and economic analysis were monitored. The result showed that final weight (217.33 – 249.33g), daily weight gain (6.30 – 7.63g) and feed conversion ratio (2.37 – 3.2) were not significantly ($p>0.05$) affected by the treatments, except average daily feed intake and mortality which were significantly ($p<0.05$) affected by the treatments. The result of blood profile showed that WBC (2.49 – 3.00($x10^9$/L)), RBC (2.06 – 2.52($x10^6$/ml)), MCV (117.73 – 120.17(fl)) and PLT (19.67 – 22.33 (cells/l)) which fall within the normal range were not significantly ($P>0.05$) affected by the treatments, except Hb, PCV, MCH, MCHC which wsere significantly ($P<0.05$) affected by the treatments. All biochemical indices were not significantly ($P> 0.05$) affected by the treatment except cholesterol and globulin. Cost of feeding/kg and cost of feed consumed per bird was lowest in T1 (#131.00) and was highest in T5 (#218.00). Feed cost/kg gain was highest in T5 (#496.75) but lowest in T3 (#221.24), while total weight gain/kg was highest in T4 (1.77kg). Cost of feeding/kg and cost of feed consumed per bird was lowest in T1 (#131.00) and was highest in T5 (#218.00). T4 (#156.00) was lowest since it contains less anti nutritional factors than the counterpart T3 (#156.00). Feed cost/kg gain was highest in T5 (#496.75) but lowest in T3 (#221.24), while total weight gain/kg was highest in T4 (1.77kg). Based on this study, replacement of DL – methionine with 2.5% HSS could result in higher profit margin for poultry farmers because most of the time, consumers prefer heavy birds with high cost than light bird with lower cost

Key words: *Moringa oleifera seed, Boiled Jatropha seed, Hibiscus sabdariffa seed, Cashew nut seed, Performance and Blood Profile*

Description of Problem

Broilers remain one of the fastest sources of readily available animal protein for human consumption because of rapid growth ,when given good nutrition and management Therefore productivity of broiler chickens need not be compromised despite increasing cost of conventional feedstuffs. Methionine has a vital role in the metabolic functioning of animal and humans,which is why it is also known as functional amino acid. Methionine and cysteine are considered as the first limiting amino acids in broiler diets based on corn and soya bean meal. It is more economical to add methionine to poultry diets than soybean

meal or other natural protein to meet the requirements (8). Recently, the safety of such practice has been questioned and their use is becoming restricted in many regions of the world. Also, the cost of synthetic methionine has been on the increase with resultant increase in the cost of finished feed. Recently, report have shown that there are other natural alternative supplements developed to replace synthetic methionine for maintaining animal performance and wellbeing (6).

Methionine is tically supplemented in broiler diets in the form of chemically produced supplements of DL-methionine or methionine hydroxyl analogue. Producer of organic diets are presently allowed to use chemical methionine supplements but regulators are seeking to eliminate chemical sources from such diets. Few natural feedstuffs are considered as rich sources of methionine. However, legume seed has recently been reported to be satisfactory replacement for DL-methionine in broiler feeds (4) and (20). Legume seed include: Cashew nut seed, Jatropha seed, Moringa seed and Hibiscus seeds.

Natural additive could influence humoral immunity of broilers (17). The objective of this study was to evaluate these legume seeds compared to a standard DL-methionine source in diets for young broiler chicks.

Materials and Methods

Site of the Experiment.

The research was conducted at the Teaching and Research Farm of the Department of Animal Science and Range Management. Madibbo Adama University Yola located in Girei Local Government Area. Girei is located in the Guinea Savannah Zone of Nigeria and lies between Latitude 90 and 11^0N of the Equator and Longitude 110 and 14^0E 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 about700mm-1600mm and an average minimum and maximum temperature of 18-40^0C and relative humidity of 20-50%. (1)

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.

Collection and preparation of ASM.

The four (4) different types of Alternative Source of Methionine include Moringa seeds, Jatropha seeds, *Hibiscus sabdariffa* seeds and Cashew nut seeds. They were being obtained in Hong market Adamawa State Nigeria, except Jatropha seeds which were collected by the researcher on near by farm . They were being processed through 48hrs soaking, 2hrs boiling and dry on sun except Cashew nut seeds which were processed through burning. They were ground into meal using grinding machine and used for the formulation.

Experimental Birds and Diets

One hundred and Fifty (150) healthy broiler chicks of nearly similar live body weights of 14 days of age were randomly allocated to five treatments with 10 birds per each replicate were per placed on deep litter after two weeks of brooding on starter feed . The chicks were protected against Gomboro, New castle and infectious Bursal Diseases by routine vaccination. 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 on *ad libitum.* The measured quantity of feed was fed to chicks every day and the leftover feed was recorded after 24 hrs. Mean live body weight (gm./chick/week) was recorded at weekly intervals from 2nd week to 6th week of study. At the end of experiment, blood samples were collected from the experimental birds for haematological and biochemical studies. At the end of the experiment ,histopathological and carcass traits were also studied. The data of entire study period was analysed using statistical methods called analysis of variance (ANOVA).

Economic Analysis

The considered economic parameter was determined using the prevailing market prices of the feedstuff at the time the experimental diets were formulated, cost of medication and that of broilers on the live weight basis.

Result and Discussion

Composition of the experimental diets, the chemical composition of the test diets and experimental diets are presented in tables 1, 2 and 3. The average daily feed intake of chicks is presented in the table 4 and 5 fed diets MOS, BJS, HSS, and CNS was significantly higher than control diet especially MOS and HSS, while BJS and CNS were significantly lower than the control diet. The feed intake, live body weight, body weight gains and FCR during the starter period were not significantly (P> 0.05) influenced by dietary treatments, except ADFI. However, during the finisher period, the dietary treatments had significantly (P< 0.05) affected feed intake, average body weight gain, final weight and FCR, except initial weight and body weight gain. Similar result was reported by (13) who found that the chicks in herbal methionine group showed a significant increase gain in body weight as compared to the chicks in control group and numerically higher weight gain as compared to the chicks in synthetic group. Different results with regards to FCR were observed by (5) who found that supplementation of herbal methionine at the rate of 15g/kg showed better FCR compared to synthetic supplemented birds. This increase in body weight gain of chicks in herbal methionine supplementation is similar to the findings of *(*12), (6) and (10). The increase in body weight and weight gain is attributed to the potential role of methionine in promoting growth, (10).

The data on haematological and biochemical indices were presented on Table 6. The packed cell volume (PCV) values ranged from 26.00 – 30.28% which fell within normal range (22- 35.0%) of broilers chickens (11) as cited by (2). PCV values varies across the treatment group. This variation may be associated with body sizes of the birds, because heavier bird has larger blood volumes than smaller ones of the same age and species as reported by *(3)* who observed higher PCV in small bird than heavier ones of the same age and species. Packed cell volume is beneficial in the assessing the protein status and possibly forecasting the degree of protein supplementation at different physiological states.*l* (7), reported that reduced values of PCV is an indication of the poor nutritional status and pointer to iron deficiency or nutritional anaemia. Red blood cell (RBC), the values follow the same trend as the PCV. No significant (P>0.05) difference was observed across the treatment groups. The RBC values in all the treatments in this study

are similar to the values obtained by (20) who reported 1.18-1.94 ($x10^{12}$/L). The haemoglobin (Hb)values across the treatment groups were significantly (P< 0.05) difference. However, the values fell within the accepted range of 7.0 – 13.0 (g/dl) for broilers (19) .While mean corpuscular volume (MCV) did not showed the significant (> 0.05) .Msean corpuscular haemoglobin concentration and mean corpuscular haemoglobin were significantly (P< 0.05) difference across the treatment groups.

White blood cell (WBC), showed no significant difference (P>0.05) across the treatments. Non- significant differences were observed in birds fed on diets supplemented with both herbal and synthetic methionine which is in agreement with (18). Herbal methionine supplementation according to (16) is totally safe and has no adverse effect even when used at 5g/kg body weight of male Wister rats.

Serum biochemical analysis is used to determine the level of heart attack, liver damage and to evaluate the protein quality and amino acid utilization in animals (14) Parameters such as albumin, creatinine, glucose, total protein and urea were not significantly difference (P> 0.05) among the treatment groups. Cholesterol and globulin were significant (P< 0.05) affected by the dietary treatments. The similarity in these results agreed with the report of (8) and (18) who did not observe any significant effect of herbal methionine supplementation on serum biochemical indices concentration of broiler chickens. However, the result obtained cholesterol and globulin in this study agreed with the report of (9) who observed significant difference when laying hens were fed diets supplemented with synthetic and herbal methionine

Table 1: Proximate composition of the test diets

Nutrients	MOS	BJS	HSS	CNS
Dry Matter	96.80	89.52	90.75	94.10
Moisture	3.20	10.48	9.25	5.90
Crude protein	10.60	29.60	31.02	24.00
Crude Fibre	8.00	11.28	4.12	1.30
Ether Extract	10.20	5.12	21.60	6.40
Ash	11.00	8.63	6.89	11.40
Nitrogen free Extract	65.00	34.82	31.24	2.30
ME(kcal/Kg)	3525.90	2748.00	4006.36	3263.05

Metabolizable energy (ME) ME = 37 x % CP + 81 x % EE + 35.5 x % NFE. (15)
MOS = *Moringa oleifera seed*
BJS = Boiled Jetropha seed
HSS = *Hibiscus sabdariffa* seed
CNS = Cashew nut seed

Table 2: Proximate composition of the Experimental Broiler Starter Diets and ASM

level of replacement of synthetic. Methionine by Alternative sources of methionine

Nutrient	0%	Control	2.5% MOS	2.5% BJS	2.5% HSS	2.5% CNS
Dry matter		88.44	88.56	88.58	88.50	88.85
Moisture		11.56	11.44	11.42	11.50	11.15
CP (%)		20.53	20.35	20.65	19.73	21.20
CF (%)		3.11	3.03	3.49	4.36	3.39
EE (%)		4.10	4.18	4.21	4.75	4.02
NFE (%)		50.86	50.31	50.33	50.10	50.04
ASH (%)		5.84	5.69	5.90	5.72	5.32
ME(kcal/k		2897.24	2877.35	2891.78	2893.31	2886.44

Metabolizable energy (ME) ME = 37 x % CP + 81 x % EE + 35.5 x % NFE. (15)

Table 3: Proximate composition of the Experimental Broiler finisher diets and ASM.

Level of replacement of synthetic methionine by Alternative sources of methionine

Nutrients	0% control	2.5% MOS	2.5% BJS	2.5% HSS	2.5% CNS
Dry matter	89.21	89.26	89.09	89.49	90.59
Moisture	10.79	0.74	10.91	10.51	9.41
CP (%)	19.56	19.54	19.23	19.51	20.01
CF (%)	3.73	3.82	4.05	4.11	4.31
EE (%)	4.10	.12	4.21	4.43	4.95
NFE (%)	56.32	56.69	6.50	56.21	56.18
Ash (%)	5.50	5.09	5.10	5.23	5.14
ME(Kcal/kg)	3055.18	3069.20	3058.27	3076.16	3135

Metabolizable energy (ME) ME = 37 x % CP + 81 x % EE + 35.5 x % NFE.(15)

Table 4: Performance of Broiler chickens at starter phase

	Diet/Treatment					
Parameters	T1 (0%)	T2 (2.5%)	T3 (2.5%)	T4 (2.5%)	T5 (2.5%)	SEM
Initial weight (g)	36.33	36.33	41.00	35.33	37.67	1.92^{NS}
Final weight (g)	233.67	233.33	217.33	249.33	232.33	12.92^{NS}
Body weight gain (g)	197.33	197.00	176.33	214.00	194.67	12.46^{NS}
ADWG (g)	7.03	7.03	6.30	7.63	7.00	14.00^{NS}
TFI (%)	628.77	631.43	439.00	523.87	557.20	34.90^{NS}
ADFI	22.47^{a}	22.53^{a}	15.67^{b}	21.10^{a}	19.90^{a}	0.97^{*}
FCR	3.20	3.22	2.37	2.87	2.87	0.28^{NS}
Mortality(%)	-	1	3	2	1	

a, b & c = Means within the same row bearing different superscript differ significantly (P< 0.05)
= Means significantly difference (P< 0.05)
NS = Not Significant
SEM = Standard Error of mean.
ASM = Alternative sources of methionine
FCR = Feed conversion ration; ADWG = Average daily weight gain; ADFI = Average daily feed intake; TFI= total feed intake

Table 5:Performance of broiler finisher chickens

Parameter	T1 (0%)	T2 (2.5%)	T3 (2.5%)	T4 (2.5%)	T5 (2.5%)	SEM
Initial wt (g)	233.67	233.33	217.33	249.33	232.33	12.92^{NS}
Final wt (g)	1597.17^{ab}	1323.50^{bc}	1162.50^{c}	1710.17^{a}	1318.17^{bc}	103.60^{*}
BWG(g)	1363.50	1090.17	926.17	1559.17	1085.83	1518.89^{NS}
ADWG (g)	48.707^{ab}	38.95^{bc}	33.08c	52.17a	38.78bc	3.66^{*}
TFI (g)	2414.17a	1848.00b	1125.33^{c}	2605.00^{a}	2356.67^{a}	126.46*
ADFI (g)	86.22^{a}	66.00^{b}	40.19^{c}	92.77^{a}	84.17^{a}	4.56*
FCR	1.78^{a}	1.71^{b}	1.22^{b}	1.79^{a}	2.24^{a}	0.15*
Mortalitys(%)	1	2	8	3	2	

a, b & c = Means within the same row bearing different superscript differ significantly (P< 0.05)
= Means significantly difference (P< 0.05)
NS = Not Significant
SEM = Standard Error of mean.

Table 4: Haematological and Biochemical indices of Broiler chickens fed ASM as a replacement for synthetic methionine

Parameters	T1 (%)	T2 (2.5%)	T3 (2.5%)	T4 (2.5%)	T5 (2.5%)	SEM
Haematology						
WBC (x 10^9/L)	2.59	2.54	2.49	3.00	2.63	4.83^{NS}
RBC (x 10^6ml)	2.48	2.23	2.06	2.44	2.52	0.14^{NS}
Hb (g/dl)	9.50^{ab}	8.63^{ab}	8.02^{b}	9.78^{ab}	10.53^{a}	0.55^{*}
PCV (%)	29.17^{ab}	26.17^{b}	26.00^{b}	28.78^{ab}	30.28^{a}	1.14^{*}
MCV (fl)	117.93	117.73	119.57	118.03	120.17	1.55^{NS}
MCH (pg)	38.42^{b}	38.87^{b}	39.05^{b}	40.10^{ab}	41.75^{a}	0.78^{*}
MCHC (g/dl)	32.58	32.98^{b}	32.67^{b}	33.98^{ab}	34.72^{a}	0.46^{*}
Biochemical indices						
Albumin (mg/dl)	1.13	1.11	1.01	1.09	1.05	0.45^{NS}
Creatinine (ummol/l)	16.53	16.40	18.17	17.09	19.18	10.06^{NS}
Glucose (ummol/l)	13.06	11.92	14.03	12.40	12.47	0.63^{NS}
Total protein (mg/dl)	3.00	3.00	2.81	3.10	2.93	1.24^{NS}
Cholesterol (mg/dl)	141.50^{b}	162.00^{ab}	164.50^{ab}	155.50^{ab}	173.17^{a}	8.29^{*}
Globulin (mg/dl)	1.84^{ab}	1.89^{ab}	1.80^{b}	2.12^{a}	1.89^{ab}	0.24^{NS}
Urea (ummol/L)	2.67	3.17	3.18	2.90	3.02	0.24^{NS}

a,b& c=means within the same row bearing differ superscript differ differently
*=means significant
SEM = standard error of means
PCV= Packed cell volume; RBC= Red Blood cell; WBC = White Blood Cell,Hb = Haemoglobin

Table 7: Economic Production of broiler chicken feed ASM as replacement for synthetic methionine.

	Diet/ Treatment				
Parameters	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

Conclusion and Application

From the result of this study, it is concluded that

1. Poultry farmers should use plants such as *Hibiscus sabdariffa*, Cashew, nuts, *Moringa oleifera* Seed, Sweet Corn and many other plants that contained high amount of methionine to prepare natural methionine that will replace synthetic methionine in their animal diets.
2. The study recommends that 2.5% of *Hibiscus sabdariffa* seed meal of natural sources of methionine can replace 0.20 % of synthetic methionine in the diet of broiler chickens.

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