

Effect of the Replacement of Sesame Seed for Methionine in Broiler Production in Middle Belt Region – Nigeria

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Abstract

The effect of replacement levels of sesame seed for synthetic methionine on growth performance, carcass yield and internal organ characteristics, haemology and biochemical indices and economics of production of broiler chicken was determined. Five diets were formulated using Sesame seed to replace methionine at 0%, 3% 6%, 9% and 12% in treatments 1, 2, 3, 4 & 5 respectively. One hundred and fifty (150) day-old broiler chickens were randomly allotted to the five dietary treatments with ten (10) birds per replicate and the diets were replicated three times in a completely randomized design. Results showed that feed intake was not significantly ($P>0.05$) affected by the replacement levels of sesame seed for synthetic methionine; daily weight gain and feed conversion ration were significantly ($P<0.05$) affected at the starter phase, where at the finisher phase they were similar across the treatments; carcass characteristics and internal organs were significantly ($P<0.05$) affected except live weight, plucked weight, liver, heart and gizzard. The economic analysis of feed showed that D1 (control) and D2 (3%) sesame seed had the least cost, the highest cost was D5 (12%) sesame seed. It was recommended that farmers should substitute sesame seed for methionine at 3% level and if they are accessible to synthetic methionine, it should be used. Greater awareness and involvement of farmer education becomes paramount in this context.

Keywords: sesame seed, methionine, biochemical indices, farmer, education,

INTRODUCTION

Poultry is the quickest source of meat and its production involves the least hazardous and arduous process in relation to other livestock enterprises. It is relatively free from some pathological, ecological and economical constraints which affect the commercial productions of other breeds and classes of livestock in Nigeria (Obioha, 1992). Oluyemi and Roberts (2000) stated that poultry meat used to be derived predominantly from spent layers in the developing countries but there is an increasing shift to broilers. Broilers are fast growing birds which reach market weight of 1.8kg to 2.5kg 8 – 10 weeks (Olomu, 1978). This weight and level of growth depends on type of feeds and administration of these feeds.

Adejoro (2004) pointed out that feed formulated with synthetic methionine which is not always accessible to rural farmers accounts for 60-75% cost of raising commercial poultry. This apparently makes it difficult for rural farmers to be self engaged in this business there by depriving intake of protein, amino-acid. This

triggered the researchers' zeal to source for locally available raw materials like Sesame seeds (*Sesamum indicum*) for formulating poultry feeds. Sesame seed (benniseed) is produced locally and it is a good source of proteins which has appreciable amount of methionine (Aduku, 1992). Sesame seed (*Sesamum indicum*) is an old cultivated crop and thought to have originated in Africa. Its fruit is an oblong, mucronate, pubescent capsule containing numerous small, oval, yellow, white, red, brown or black seeds. It is also considered as one of the major world oil crop grown by small farmers in developing countries (Run Catlin, Romero & Cowley, 1999). Sesame seed meal has a higher content of methionine than most plant protein supplements. When used in the right proportions together with soyabean meal which has a higher content of lysine; a balanced diet with respect to lysine and methionine will result (Olomu, 1978).

Synthetic methionine is an essential amino acid which is usually added in the formulation of poultry diets. This synthetic methionine is found in towns and cities which is not always accessible to rural farmers (Turaki, 2005). This was why the study became pertinent in order to address unbalanced diet, inaccessible diet,

unaffordable diet and acute poverty amongst rural farmers in the middle belt-region of Nigeria. The study will be useful for farmer educators, would be farmers and those already in the farm business.

MATERIALS AND METHODS

The study was conducted at the Poultry Research Farm of the Department of Animal Science, federal University of Technology Yola, Adamawa State located at the North-Eastern part of Nigeria and University of Agriculture, Makurdi, Benue State located in the Southern Guinea Savannah Ecological Zone of Nigeria, in 2009. The study adopted pure experimental design.

Five treatment diets were formulated in which diet one served as the control, while diets 2, 3, 4 and 5 were formulated using sesame seed at 3, 6, 9 and 12% replacement levels respectively as shown in tables 1 & 2. The one hundred and fifty (150) day-old broiler chicks were randomly allotted to the five(5) dietary treatments with ten(10) birds/treatment replicated three times (3) in a completely randomized design. The growth performance of the birds was determined by measuring the rate of feed intake, weight gain, and feed conversion ratio. At the end of the experiment, which lasted for eight weeks, the birds were fasted for twelve hours before slaughtering the next day to empty the crop and minimize residual ingesta. Two birds were randomly selected from each of the replicates and weighted before the slaughter in the morning. Data was collected on eviscerated weight, carcass weight & dressing percentage. The internal organs which include the liver, heart, caecum length, kidney, gizzard & pancreas were measured and expressed as a % of body weight.

At the end of the experiment, blood sample was collected from two birds in each treatment group for the determination of the haematological and biochemical parameters. Blood samples for haematological parameter were collected with an anti-coagulant ethylene diamine tetra-acetic acid (EDTA) while those for serology were collected without anti-coagulant. The haematological parameters measured were the packed cell volume (PCV), Red blood cell (RBC), white blood cell (WBC) and Haemoglobin (HB) concentration. The serum biochemical indices was used to measure the levels of Protein, Urea, Creatinine, Cholesterol, albumin and globulin. The chemical analysis of the experimental diets and sesame seed meal were carried out using the Association of Analytical chemist method (AOAC, 1994). (ANOVA) and the treatment means were separated using Duncan's multiple Range test (Duncan, 1955).

RESULTS AND DISCUSSION

The result of the proximate composition of black sesame seed revealed that the crude protein was

20.94%, crude fibre, 18.79%, Ash-5.12% and dry matter-96.43%. This result is similar to the result reported by Olomu (1978), that sesame seed contain crude protein, 22.30%; crude fibre; 10.30%; dry matter, 92.6% and ash, 5.30%. However, it varies with that of Alharthi, et al (2009) which has the following chemical composition moisture, 8.40%; crude fibre 5.36%; crude protein, 29.52%; ether extract, 11.40%; nitrogen free extract, 40.17% and ash, 5.15%. The differences observed from the already established values can be attributed to the different sources of the sesame seed, cultivar, method of processing, length of storage and storage condition (Ojewole and Ewa, 2005).

The result of amino acid profile of black sesame seed indicated that black sesame seed has methionine, 3.10g/100g protein; lysine, 6.69g/100g protein. This result differs with that of Obioha, (1992) who also had the following values in g/100 protein. Methionine, 3.6; lysine, 2.6; Threonine, 3.6; Histidine, 2.2; valine, 4.5; isoleucine, 3.4; Leucine, 7.1; phenylalanine, 4.6 and Tryptophan, 2.1. The differences in these results might be due to greater variability in processing temperature during oil extraction from the seeds (Rao et al, 2008).

There was no significant ($P>0.05$) difference on feed intake across the dietary treatments in all the phases of broiler growth. However, on numerical grounds, feed intake was higher in treatment 2 at starter phase, higher in treatment 1 at finisher phase and higher in treatment 2 when pooled; while it was lower in treatment 3 and 4 at starter phase and finisher phase respectively and lower in treatment 4 when pooled.

The differences in the rate of feed intake as shown in the various treatments indicates that it was influenced by the amount of Methionine present in the diet. At the starter phase, treatment 2 which has 3% level of sesame seed had higher feed intake followed by treatment 1 which has synthetic methionine and at the finisher phase, treatment 1 (control) had higher feed intake followed by treatment 2 which has 3% level of sesame seed. Those treatments that has more than 3% level of sesame seed had low feed intake which showed that methionine content in those treatments was not equivalent to that of treatment 1 and 2. This agrees with Olomu, (1978) who reported that chickens fed on available methionine consumed more feed per unit body weight compared with those on low normal available methionine diets. This was also supported by Al-Harhi and El-Edeek (2009) who reported that birds consumed less containing high amount of sesame.

The economic analysis of feeding broiler chickens with sesame seed showed that the lowest feed cost were observed in treatment 1 (control) N1,088.86 and treatment 2(N1,392.67). The feed cost continued to increase in the subsequent treatments as the level of inclusion of sesame seed continue to increase. The

highest cost being treatment 5(N1,894.43) with inclusion level of sesame seed of 12%. The reason for the high cost of production incurred in the levels of sesame seed was attributed to the period the sesame seeds were bought. However, the recommended level for using sesame seed in the formulation for good performance without any adverse effect on the birds is 3%. This particular result disagreed with Turaki, (2005) who asserted that it is more cheaper to use sesame in formulating the diet than the synthetic methionine. The differences in the cost could be due to the time the studies were done and the seasons of the harvest of sesame seed. However, it supports Igbal, et al (1998) who stated that diets containing seed oils like sesame are comparatively costly but net profit is higher. This calls for adequate awareness and farmer education for the rural poor. Farmers at the grassroot who are the real producers and target participants need effectiveness and functional training and re-training on the formulation of various kinds of feed with local materials that are readily available, affordable and useable for high profit maximization.

CONCLUSIONS

Farmer education becomes pertinent prelude to adequate understanding of feed formulation using local raw materials that are usually and readily available. Results of this study indicate that unprocessed sesame seed meal can be included at 3% level to replace synthetic methionine in the diet of broilers without adverse effects on the productive performance, blood parameters, carcass components of the birds.

The feed cost in naira per kilogram gain was better in the control diet where synthetic methionine was used than the diets where sesame seed were used. However, the use of sesame seed for methionine at 3% level could be advantageous and economical to the farmers who are distant from the cities where they could not get the synthetic methionine and also when the synthetic methionine is said to be scarce or not available. The production could still thrive successfully with a good weight gain attainable using sesame seed.

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APPENDIX

Table 1: Proximate Composition of Black Sesame Seed

Nutrient	% Composition
Crude protein	20.94
Crude fibre	18.79
Ether extract	31.5
Ash	5.12
Moisture	3.57
Organic matter	91.31
Dry matter	96.43

Table 2: Amino Acid Profile of black Sesame Seed

Amino Acid	Concentration g/100 Protein
Lysine	6.69
Hictidine	3.13
Arginine	8.85
Aspartic acid	10.50
Threonine	4.13
Serime	5.50
Glutamic acid	25.06
Proline	3.19
Glycine	7.19
Alanine	7.19
Cystine	4.89
Valine	3.49
Methionine	3.10
Isoleucine	3.92
Leucine	10.02
Tyrosine	6.60
Phenylalanine	7.78

Table 3: The Effect of replacement Levels of black Sesame Seed for Methionine on the Feed Intake of Broiler Chickens (0-4 weeks) Starter Phase.

Parameters	Treatments					SEM	Remarks
	1	2	3	4	5		
Daily feed intake(g)	60.15	62.03	59.03	56.65	57.09	1.83	NS
Average daily weight gain(g)	51.04 ^a	42.89 ^{ab}	40.88 ^{ab}	40.67 ^{ab}	35.67 ^b	3.21	*
Feed conversion ratio	1.18 ^b	1.51 ^{ab}	1.44 ^{ab}	1.39 ^{ab}	1.60 ^a	1.14	*
Mortality	1	1					

Means with different superscripts on the same raw are significantly different

* = P<0.05

NS = Not significant

SEM = Standard error of means

Table 4: The Effect of Replacement Levels of Black Sesame Seed for Methionine on the Feed Intake of Broiler Chickens from (5-8 Weeks) Finisher Phase.

Parameters	Treatments					SEM	Remarks
	1	2	3	4	5		
Daily feed intake(g)	88.57	87.80	83.23	79.72	80.06	4.13	NS
Average daily weight gain(g)	55.72	54.70	49.70	48.49	46.31	3.02	NS
Feed conversion ratio	1.6	1.62	1.68	1.68	1.72	2.82	NS
Mortality				1			

NS = Not significant

SEM= Standard error of means

Table 5: The Effect of Replacement Levels of Black Sesame Seed for Methionine on the Feed Intake of Broiler Chickens when Pooled (1-8 Weeks)

Parameters	Treatments					SEM	Remarks
	1	2	3	4	5		
Daily feed intake(g)	74.36	74.92	71.13	68.19	68.57	2.78	NS
Average daily weight gain(g)	53.38 ^a	48.79 ^{ab}	45.29 ^{ab}	44.57 ^{ab}	40.99 ^b	2.88	*
Feed conversion ratio	1.39	1.56	1.56	1.52	1.66	2.68	*
Mortality	1	1		1			NS

* = P<0.05

NS = Not significant

SEM = Standard error of means

Table 6: Carcass Yield and Internal Organ Characteristics of Broiler Chickens Fed Various Replacement Levels of Sesame Seed for Methionine.

Parameters	Treatments					SEM	Remarks
	1	2	3	4	5		
Live weight(g)	1840	1760.00	1660.67	1746.67	1573.33	106.83	NS
Plucked weight(g)	1686.67	1580.00	1506.67	1513.33	1400.00	89.59	NS
Eviscerated weight(g)	1486.67	1470	1350.00	1376.67	1230	87.36	NS
Carcass weight(g)	1416.67 ^a	1356.67 ^{ab}	1243.33 ^{ab}	1296.67 ^{ab}	1102.67 ^b	85.62	*
Dressing %	5.53	5.53	7.01	7.47	7.47	1.55	NS
Head	52.57 ^a	47.83 ^{ab}	39.77 ^b	45.53 ^{ab}	40.13 ^b	2.94	*
Wings	147.97	139.37	142.63	147.97	125.37	11.53	NS
Thorax	268.77 ^a	158.30 ^{ab}	113.90 ^b	164.20 ^{ab}	93.33 ^b	35.52	*
Neck	105.07 ^a	102.27 ^{ab}	89.93 ^b	95.63 ^{ab}	91.63 ^{ab}	4.02	
Back	231.90	203.63	224.90	217.90	182.87	18.12	NS
Breast	184.40 ^b	239.13 ^{ab}	282.33 ^b	231.33 ^{ab}	159.43 ^{ab}	23.95 [*]	**
Thighs	227.23 ^a	184.17 ^{ab}	157.40 ^b	167.67 ^{ab}	157.70 ^b	17.53	*
Drumsticks	190.33 ^a	177.97 ^{ab}	175.43 ^b	167.67 ^{ab}	157.70 ^b	17.53	*
Shanks	92.63 ^a	78.50 ^a	38.60 ^b	75.93 ^a	60.23 ^{ab}	9.94	*
Internal Organs							
Liver	1.49	1.47	1.22	1.39	1.31	2.98	NS
Heart	.47	.54	.39	.48	.36	1.90	NS
Caecum length	37.00 ^a	38.67 ^a	30.67 ^b	36.67 ^a	29.80 ^b	1.71	*
Caecum weight	1.02 ^{ab}	1.13 ^a	.83 ^b	.79 ^a	.84 ^b	7.55	*
Small intestine length	65 ^{ab}	98.93 ^a	73.33 ^{ab}	58.67 ^b	89.67 ^{ab}	10.88	*
Small intestine weight	1.05 ^b	1.37 ^a	1.17 ^{ab}	1.09 ^{ab}	1.20 ^{ab}	2.85	*
Kidney	.29 ^c	.56 ^a	.35 ^{bc}	.41 ^{abc}	.49 ^{ab}	1.89	*
Gizzard	1.52	1.51	1.29	1.39	1.33	2.72	NS
Pancreas	.15 ^b	.23 ^a	.14 ^b	.14 ^b	.15 ^{ab}	2.37	*
Lungs	64 ^{ab}	67 ^a	.47 ^b	.74 ^a	.64 ^{ab}	1.67	*
Spleen	.15 ^{ab}	.17 ^a	9.000E-02 ^b	.14 ^{ab}	12 ^{ab}	2.11	*

Means with different superscripts on the same raw are significantly different

* = P<0.05, ** = P<0.001

NS = Not significant

SEM = Standard error of means

Table 7: The Economic Analysis of Feeding Broiler Chickens with Sesame Seed as a Replacement for Methionine

Parameters	Treatments					SEM	Remarks
	1	2	3	4	5		
Total Feed Intake(g)	2391.00	2345.67	2330.33	2158.33	2241.67	96.86	NS
Cost of feed intake(₦)	45.54 ^e	58.54 ^d	63.87 ^c	74.19 ^b	84.51 ^a	00	
Cost of total feed intake(₦)	1,088.86 ^c	1,392.67 ^b	1,488.38 ^b	1,601.27 ^b	1,894.43 ^a	94.91	***
Total weight gain	1503.67	1460.67	1391.67	1314.67	1296.67	93.87	NS
Cost of feed/kg naira gain	72.89 ^d	96.38 ^c	107.07 ^{bc}	122.47 ^b	145.76 ^a	5.73	***

Means with different superscripts on the same raw are significantly different

*** = P<0.001

NS = Not significant, SEM = Standard error of means

Table 8: Haematological and Biochemical Indices of Broiler Chickens Fed Various Replacement Levels of Sesame Seed for Methionine

Parameters	Treatments					SEM	Remarks
	1	2	3	4	5		
Haematological Indices:							
PVC	33.33	30.80	27.77	31.90	30.03	2.04	NS
HB	9.67	9.03	8.27	9.27	8.87	1.98	NS
RBC	2.58	2.31	2.08	2.38	2.13	1.57	NS
WBC	232.33	226.43	216.27	230.85	223.33	7.56	NS
MCV	130.70 ^b	136.50 ^{ab}	133.13 ^{ab}	134.23 ^{ab}	139.37 ^a	2.46	*
MCH	37.60 ^b	39.07 ^b	39.73 ^{ab}	39 ^b	41.70 ^a	2.51	*
MCHC	29	29.30	29.77	29.03	29.90	4.0	NS
Biochemical Indices:							
Protein	40 ^a	36.67 ^{ab}	35 ^{ab}	35 ^{ab}	31.67 ^b	1.9	*
Cholesterol	93.93	90.90	90.90	109.08	87.87	7.29	NS
Urea	1.39	.85	1.49	.85	.64	3.54	NS
Creatinine	31.55	33.65	25.24	23.14	29.45	4.31	NS
Albumin	18.99 ^a	18.75 ^a	16.77 ^{ab}	16.85 ^{ab}	13.57 ^b	1.12	*
Globulin	21.01	17.92	18.23	17.98	18.10	2.08	NS

Means with different superscripts on the same raw are significantly different

*** = P<0.05

NS = Not significant

SEM = Standard error of means