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PERFORMANCE OF BROILER CHICKENS FED RAW AND TOASTED SESAME SEED (*Sesanum indicum*, L) AS A SOURCE OF METHIONINE

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ABSTRACT
A trial was conducted to determine the performance and economics of production of broiler chickens fed raw and toasted sesame seed meal as a dietary source of methionine. A total of two hundred (200) day old Anak 2000 broiler chicks were allocated to five dietary treatments with forty (40) birds per treatment in a completely randomized design. Average daily feed intake (ADFI) at both starter (1-4 weeks) and finisher (5-8 weeks) phases were not significant. The values ranged from 50.29 to 57.86g and 102.48 to 122.15g for the starter and finisher phases respectively. The average daily weight gain (ADWG) which was between 20.61 and 23.21g for the starter and between 40.27 and 49.72g for the finisher followed similar trends. Feed conversion ratio (FCR) was also not significant for both starter and finisher phases. Mortality was high for the raw (5 and 10%) and 10% toasted sesame seed meal; four (4) birds in each case across the phases. Total feed intake (kg/bird) was high for the control birds (4.91kg/bird) compared to the other treatments. Feed coat (₦/kg feed) and total feed cost (₦/bird) were between ₦52.64-54.71/kg feed and ₦234.16-258.51/bird respectively. Total weight gain (kg/bird) was similar for both raw and toasted sesame seed meal irrespective of inclusion level. Feed cost (₦/kg gain) was lowest for the control diet (₦129.23) and highest for birds on 10% raw sesame seed meal (₦149.54). Based on the results of this study, it can be concluded that raw or toasted sesame seed meal can be included in broiler diets up to 10% level to substitute for synthetic methionine without adverse effects on growth performance.

KEYWORDS: Performance, broiler, raw, toasted, sesame, methionine, source

INTRODUCTION

The biggest problem facing small scale broiler producers in developing countries is that of supplying protein of the right quality and quantity (essential amino acids) in the diet because the largest proportion of dry matter growth is early life is that of protein (Card *et al*., 1979).

Proteins of legumes are of high nutritional value although they are not generally rich in lysine, methionine and tryptophan (Olomu, 1995). Protein from a single source is not always adequate to satisfy the nutritional requirement of monogastric animals (Church and Pond, 1978).

Methionine is one of the essential amino acids required by poultry and it is very low in soyabeans which is the major conventional plant protein source used in poultry diet. As a result, most poultry farmers purchase synthetic methionine to supplement soyabeans based diets which is usually expensive and not easily available.

Sesame seed is reported to provide a nearly complete protein supplement for most farm animals (Weiss, 1971). McDonald *et al* (1998) and Robbelen *et al* (1989) reported that sesame seed is rich in leucine, arginine and methionine, but relatively low in lysine.

However, as with most tropical legumes, sesame seed contain anti-nutritional factors, which is known to reduce its nutritive value in poultry feed. Various methods have been elucidated in studies to either reduce or completely eliminate these anti-nutritional factors in sesame seed meal.

Performance parameters such as weight gain, feed intake and feed conversion ratio (FCR) vary depending on the level of inclusion of sesame seed meal in the diet even when treated.

This study was therefore aimed at determining the effect of raw and toasted sesame seed meal diet on the performance, dressed weight and organ weight characteristics of broilers.

MATERIALS AND METHODS

White coat coloured sesame seeds sourced from the open market in Bauchi metropolis in the north-east agricultural zone of Nigeria were used for the studies. Some of the sesame seed were toasted at a temperature of between 100-110^{o}C for three to five minutes (until the coat turned brown). The toasted sesame seed after cooling under shade was milled and the resulting product labelled toasted sesame seed meal (ToSSM). The raw sesame seed was also milled and the product labelled raw sesame seed meal (RaSSM).

Raw and toasted sesame seed meals were used to replace soyabeans meal at 0, 5 and 10% levels. The composition of the starter and finisher rations are presented in Tables 1 and 2.

Each broiler starter diet was fed to four (4) replicates of ten (10), seven (7) day-old Anak 2000 broilers for 28 days. The broiler finisher diets were fed to the same replicates and number of birds for the subsequent 28 days in a completely randomized design experiment. The initial live weight, weekly weight gain and daily feed intake of the broilers were recorded and the values used to determine the weight gain, feed conversion ratio (FCR), feed intake and economics of production.

At the end of the finisher phase (28 days), two broilers were randomly selected from each replicate, starved of feed for 12hours, slaughtered, defeathered to determine the dressed weight and eviscerated to determine the internal organ weight(liver, gizzard, spleen, caeca, small and large intestines etc.) and offal (legs and head).

The dressing weight were measured using a spring balance while the internal organ weight were determined using the sensitive ACCULAB electric scale.

Statistical analysis

Data obtained were subjected to analysis of variance (ANOVA) as outlined by Steel and Torrie (1984). Where significant differences were detected, means were separated using Duncan's' multiple range test (Duncan, 1955).

RESULTS

The effect of raw and toasted sesame seed meal on the performance of broiler chickens at the starter phase (1-4 weeks) is shown in Table 3. The average daily feed intake (ADFI) ranged between 50.29 to 57.86g/bird/day. Birds fed 10% raw sesame seed meal (RaSSM) recorded the least ADFI (50.29g/d) whilst birds on 5% RaSSM had the highest ADFI (57.86g/bird/day). However, the values were not significantly different across dietary treatment.

The average daily weight gain (ADWG) was highest for birds fed 5% toasted sesame seed meal (ToSSM) and lowest for those on 10% RaSSM.

The feed conversion ratio (FCR) was not significantly influenced by dietary treatment. Birds fed 5% ToSSM had the lowest FCR (2.43).

Table 4 shows the performance of broiler chickens fed RaSSM or ToSSM at the finisher phase (5-8 weeks). Similar to the starter phase, the ADFI, ADWG and FCR were not influenced by dietary treatments. The values ranged between 102.47 to 122.15g/d, 37.72 to 49.72g/d and 2.48 to 2.93 for ADFI, ADWG and FCR respectively. The lowest ADFI and ADWG were recorded by birds on 10% ToSSM (102.47g/d) and 10% RaSSM (37.72g/d) respectively.

The economics of feeding broiler RaSSM and ToSSM diets are shown in Table 5. The total feed intake (TFI) which ranged between 4.28 to 4.91 kg/bird was highest for birds on the control diet whilst the lowest TFI was recorded for birds on 10% ToSSM. The feed cost (₦/kg feed) was lowest for birds on the control diet. However, similar values were obtained for birds on 5% ToSSM and RaSSM whereas birds on the 10% ToSSM and RaSSM recorded the highest and similar values.

The total feed cost (TFC) (₦/bird) which was between 234.16 and 258.51 was highest for birds on the 5% ToSSM (₦258.51/bird) but, similar to the control diet (₦258.46/bird). Birds on the 5% and 10% RaSSM had similar TFC; ₦247.85/bird and ₦246.74/bird for 5% RaSSM and 10% RaSSM respectively.

The total weight gain (TWG) (kg/bird) was highest for birds on the control diet (2.00kg/bird) but, lowest for those on the 10% RaSSM (1.65kg/bird). The feed cost (₦/kg) was lowest for the control diet (₦129.23/kg gain), while 5% ToSSM and 10% RaSSM recorded similar values; ₦144.42 and ₦149.50/kg gain respectively.

DISCUSSION

The average daily feed intake (ADFI) was not significantly influenced by dietary treatments during the starter phase (1-4 weeks). This result confirms earlier reports of Akanji *et al* (2003) who observed no significant difference in feed intake across treatment groups of birds fed raw and differently processed sesame seed meal. The slightly low value recorded for diet containing 10% raw sesame seed meal (50.29g/d) may be attributed to the activity of anti-nutritional factors present in the raw sesame seed (McDonald *et al*., 1998).Similarly, the ADFI for the finisher phase (5-8 weeks) also show no significant difference across dietary treatments. This result agrees with the report of Okonkwo *et al* (2007) who found no significant difference in feed intake among birds fed different dietary levels of shrimp waste meal. However, the slightly higher value (122.15g/d) for the control diet could be attributed to the methionine content which is in consonance with the results of Harms *et al* (1998) who indicated that methionine and energy influence feed intake because daily energy increases as the methionine increases. Nadeem *et al* (1999) also reported that chicken fed on high available methionine consumed more feed per unit body weight compared with those on low and normal available methionine diets.

The average daily weight gain (ADWG) during the starter phase did not show any significant difference among the treatment means. The finisher phase gave a similar pattern. This observation is contrary to the reports of Turaki (2005) who recorded a significant difference in ADWG when broilers were fed dietary levels of sesame seed meal. However, in a similar report (Mamputu and Buhr, 1995) observed no significant difference in daily feed intake and daily weight gain across dietary treatments when sesame seed meal replaced soyabean meal in layers' diet. The slightly higher value for the control diet at the finisher phase (49.72g/d) could be due to the level of methionine in the diet. Wallis (1999) observed that chickens grew significantly faster and ate more when there was an increase in the level of methionine in the diet. However, Akanji *et al* (2003) recorded significant depression in weight gain of broilers fed raw sesame seed meal based diet.

The control had the lowest feed cost (₦/kg feed) and also feed cost (₦/kg gain). It also had the highest weight gain. The diets containing 5% raw and 5% toasted sesame seed meal had similar feed costs (₦/kg feed) and total weight gain but different feed cost (₦/kg). The differences in feed cost (₦/kg gain) was as a result of differences in total feed cost (₦) as there is a relationship between total feed cost, total weight gain and feed cost (₦/kg gain). As the total feed cost (₦) increases the feed cost (₦/kg gain) also increases and vice-versa. This result shows that the control diet was more economical than the sesame seed based diet. This could be attributed to the high cost of sesame seed purchased off-season. It becomes cheaper and economical to purchase large quantity of sesame seed at harvest time since it requires no storage chemicals for use during off-season.CONCLUSION

From the results of this study, it may therefore be concluded that sesame seed meal can be included in the diet of broiler chickens up to 10% as substitute for synthetic methionine without having effect on growth performance of the birds. However, the high cost in using sesame seed can be off-set by buying sesame seed during harvest time and store for future use in production of the birds.

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Table 1: Percentage composition of experimental diets fed to broilers at the starter phase (1-4 weeks)

Ingredients	Dietary Level of sesame seed (%)				
	0% Control	5% Toasted	10% Toasted	5% Raw	10% Raw
Maize	43.20	41.20	39.10	41.20	39.10
Soyabean	40.10	37.20	34.30	37.20	34.30
Sesame seed	0.00	5.00	10.00	5.00	10.00
Wheat offal	10.00	10.00	10.00	10.00	10.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.00	0.00	0.00	0.00
TOTAL	100	100	100	100	100
Calculated analysis					
Crude protein	23.01	23.01	22.99	23.01	22.99
ME (Kcal/kg)	2991.10	3006.05	3017.09	3006.05	3017.09
Calcium (%)	1.20	1.25	1.29	1.25	1.29
Phosphorus (%)	0.97	1.00	1.00	1.00	1.00
Crude fibre	4.20	4.60	4.90	4.60	4.90
Methionine	0.42	0.30	0.34	0.30	0.34

Each 2.5kg premix contains the following; Vit. A, 10,000,000 IU; D3, 3,000,000 IU; Vit. K, 2.3g; Thiamine-B_1, 1.7g; Riboflavin-B_2, 5.0g; Pyridoxine-B_6, 3.1g; Vit. B_{12}, 16mg; Biotin, 60mg; Niacin, 31.0g; Pantothenic acid, 8g; Folic acid, 0.8g; Manganese, 85g; Zinc, 50g; Iron, 25g; Copper, 6g; Iodine, 1.1g; Selenium, 120mg; Cobolt, 220mg; B.H.T., 60g; Ethoxyquin, 65g; Choline chloride, 200g.

Table 2: Percentage composition of experimental diets fed to broilers at the finisher phase (5-8 weeks).

Ingredients	Dietary Level of Sesame seed (%)				
	0% Control	5% Toasted	10% Toasted	5% Raw	10% Raw
Maize	49.70	47.00	45.50	47.60	45.50
Soyabean	34.60	31.80	28.90	31.80	28.90
Sesame seed	0.00	5.00	10.00	5.00	10.00
Wheat offal	12.00	12.00	12.00	12.00	12.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.00	0.00	0.00	0.00
TOTAL	100	100	100	100	100
Calculated analysis					
Crude protein	19.99	20.00	20.00	20.00	20.00
ME(Kcal/kg)	2998.20	3082.30	3163.10	3082.30	3163.10
Calcium (%)	1.20	1.24	1.28	1.24	1.28
Phosphorus(%)	0.98	0.99	1.00	0.99	1.00
Crude fibre	4.30	4.70	5.00	4.70	5.00
Methionine	0.39	0.31	0.33	0.31	0.33

Each 2.5kg premix contains the following; Vit. A, 10,000,000 IU; D3, 3,000,000 IU; Vit. K, 2.3g; Thiamine-B_1, 1.7g; Riboflavin-B_2, 5.0g; Pyridoxine-B_6, 3.1g; Vit. B_{12}, 16mg; Biotin, 60mg; Niacin, 31.0g; Pantothenic acid, 8g; Folic acid, 0.8g; Manganese, 85g; Zinc, 50g; Iron, 25g; Copper, 6g; Iodine, 1.1g; Selenium, 120mg; Cobolt, 220mg; B.H.T., 60g; Ethoxyquin, 65g; Choline chloride, 200g.

Table 3: Performance of broiler chickens fed raw or toasted sesame seed meal at the starter phase (1-4 weeks).

	Dietary Levels of Sesame seed (%)					SEM
	0 %	5% RaSSM	10% RaSSM	5% ToSSM	10% ToSSM	
Parameters						
ADFI (g)	54.49	57.86	50.29	56.27	52.58	3.02^{NS}
ADWG (g)	21.70	21.10	20.61	23.21	21.24	1.71^{NS}
FCR	2.56	2.774	2.44	2.43	2.57	0.18^{NS}
Mortality(No.)	2	4	4	1	4	-

ADFI= Average daily feed intake; ADWG= Average daily weight gain; FCR= Feed conversion ratio; RaSSM= Raw sesame seed meal; ToSSM= Toasted sesame seed meal.

Table 4: Performance of broiler chickens fed raw or toasted sesame seed meal at the finisher phase (5-8 weeks).

Parameters	Dietary Level of Sesame seed (%)					SEM
	0% Control	5% RaSSM	10% RaSSM	5% ToSSM	10% ToSSM	
ADFI(g)	122.15	109.83	108.43	115.41	102.47	4.54^{NS}
ADWG (g)	49.72	40.77	37.72	42.91	40.28	2.88^{NS}
FCR	2.48	2.70	2.93	2.74	2.56	0.16^{NS}
Mortality (No.)	2	1	1	0	1	-

ADFI= Average daily feed intake; ADWG= Average daily weight gain; FCR= Feed conversion ratio; RaSSM= Raw sesame seed meal; ToSSM= Toasted sesame seed meal.

Table 5: Economics of production of broiler chickens fed raw or toasted sesame seed meal diet.

Parameters	Dietary Levels of sesame seed meal (%)				
	0% Control	5% Raw	10% Raw	5% Toasted	10% Toasted
Total feed intake (kg/bird)	4.91	4.65	4.51	4.85	4.28
Feed cost (₦/kg feed)	52.64	53.30	54.71	53.30	54.71
Total feed cost (₦ /bird)	258.46	247.85	246.74	258.51	234.16
Total weight gain (kg/bird)	2.00	1.79	1.65	1.79	1.70
Feed cost (₦/kg gain)	129.23	138.46	149.54	144.42	137.74

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