
Utilization of sesame meal as protein source in broiler diets

E. I. Ikani, S. W. Oyibo* and A. O. Aduku**

National Agricultural Extension And Research, Liaison Services (Naerls)
Ahmadu Bello University, P. M. B. 1067 Samaru,, Zaria Nigeria.

*National Productivity Centre, P. O. Box 4243 Sokoto, Nigeria.

**Formerly Of Department Of Animal Science, Ahmadu Bello University, Zaria, Nigeria

Abstract

A broiler feeding trial was conducted to determine the optimum replacement value of sesame (*Sesamum indicum* L.) meal for soyabean in maize-soyabean diets. A total of 252 day-old Anak 80 strain broiler-type chicks were used. Three replicate groups of 14 birds each were randomly allotted on six treatment diets containing 0, 10, 15, 20, 30 and 40% of sesame meal in the diets. Feed and water were provided *ad libitum*. Results showed that broiler birds fed up to 15% level of sesame meal in diets performed significantly ($P < 0.05$) better than those fed on control diets for all the parameters studied. Feed consumption and feed efficiency values were also significantly lower for birds fed 15% sesame meal diets compared to those on control. However, sesame meal at 30 and 40 percent in diets significantly ($P < 0.05$) depressed growth performance of broiler birds. It was found from this study that, up to 15% sesame meal could be used in maize-soyabean broiler diet without adverse effect on growth parameters.

Keywords: Utilization, Sesame meal, Broiler diets.

Introduction

In modern poultry farming, the goal is to maximize net returns (Akpodiete *et al.*, 2000). Feed cost comprises of about 65 to 70% of the total production cost in poultry enterprise; but feed resources are limited. To make production economically efficient, the feed cost has to be lowered down. There is a large number of non-conventional, high potential protein sources for livestock feeding, particularly the monogastric species.

Sesame meal is one of such ingredients that have been recognized as a high quality plant protein supplements for poultry feeds. The crop has been reported to be an excellent source of essential amino acids such as methionine, cystine and tryptophan but low in lysine and threonine. About 80% of its protein is digestible (Poultry Planner 1999). Several workers have

pointed out that sesame meal is a good supplement to soyabean, ground nut cake, blood meal and other protein sources deficient in methionine (Rhenseen, 1972) and (Oluyemi, *et al.*, 1976). Sesame meal is also reported to be well liked by poultry and keeps well in storage (Balloun, 1980).

Research information on sesame meal inclusion in broiler rations in Nigeria is scarce. Couple with the present exorbitant costs of conventional protein sources for poultry feeds, investigation into indigenous, cheap and readily available alternative sources of protein is imperative.

This study was therefore designed to:

- a. Estimate the optimum level at which sesame meal will supplement soyabean meal in broiler diets.
- b. Determine the effect of sesame meal on broiler performance parameters such as:

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body weight, feed intake and feed efficiency.

Materials and Methods

Sesame seeds used in this study were purchased from local Zaria market in Kaduna State. The seeds were of the early variety grown in parts of Kano State. Mechanical crushing and oil extraction of the sesame seeds were done in the United Oil Mill Limited, Zaria at a temperature range of 52 C to 72 C and pressure of 58kg/cm². Sesame meal samples were collected, prepared and subjected to proximate and chemical composition analysis, according to the methods of A.O.A C, (1990), before inclusion into the experimental diets as shown in table 1.

A total of 252 day-old Anak 80 strain broiler chicks were used in the feeding trials. Three replicate groups of 14 chicks each were randomly placed on six experimental diets. Group average weights of birds at day old were similar. The contents of maize-soyabean basal diets used in the study are presented in tables 2 and 3. There were six experimental diets containing 0, 10, 15, 20, 30 and 40% sesame meal in rations. The chicks were brooded on wood-shavings as litter materials in a tropical-type open-sided poultry house with

equal size pens. Hurricane lanterns and 100 watts electric bulbs provided continuous light and heat during the 0-4 weeks of age. Weekly records of weight gains of birds, feed intake, feed efficiency and mortality for the corresponding period were kept for each replicate group. Data collected on performance were subjected to analysis of variance (ANOVA) for a completely randomized design. Least significant difference (LSD) was also used to compare and separate means of the experimental diets (Steel and Torrie 1980).

Results and Discussion

Performance of Chicks on Experimental Diets (0-4 weeks)

Data on feeding trials of chicks during 0-4 weeks is summarized and presented in table 4. Results showed that body weight gain (650.0g) of chicks fed 15% sesame meal diet was significantly ($P<0.05$) better than the birds (592.59g) on control diet. But chicks on 20, 30, and 40 percent sesame meal diets indicated significantly ($P<0.05$) lower body weight gain than the group on control. Those groups on 10% sesame meal showed no difference when compared with the birds fed control diets. Reports by Cuca and Skirde (1968) in earlier studies are closely related to this finding. They indicated that 18% sesame meal inclusion

TABLE 1: Proximate analysis of roasted sesame seeds and meal (% air dry basis)

| Parameter | Roasted seed | Meal |
|---------------|--------------|------|
| Dry Matter | 98.47 | 95.9 |
| Crude Protein | 29.29 | 29.6 |
| ME (Kcal/kg) | 2664 | 2646 |
| Ether Extract | 43.20 | 42.5 |
| Crude Fiber | 3.58 | 4.20 |
| Ash | 3.68 | 4.26 |
| Ca | 0.42 | 0.67 |
| P | 0.45 | 0.60 |
| Mg | 0.27 | 0.29 |

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Table 2: Composition of broiler starter diets with graded levels of sesame meal.

| Ingredients | LEVELS OF SESAME MEAL IN DIETS (%) | | | | | |
|-----------------------------|------------------------------------|---------------|---------------|---------------|---------------|---------------|
| | Control | 10% | 15% | 20% | 30% | 40% |
| Maize | 54.75 | 50.25 | 48.25 | 46.25 | 41.25 | 37.25 |
| Sesame meal | - | 10.00 | 15.00 | 20.00 | 30.00 | 40.00 |
| Soybean meal | 45.0 | 36.00 | 33.00 | 30.00 | 25.00 | 19.00 |
| Bone meal | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Common salt | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Vit/Min Premix* | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Calculated Analysis: | | | | | | |
| Crude protein (%) | 23.10 | 23.90 | 23.20 | 23.20 | 23.40 | 23.40 |
| M. E. (Kcal/kg) | 2800. | 02791.24 | 2787.8 | 2784.3 | 2765.55 | 2758.54 |
| Ca (%) | 1.0 | 1.20 | 1.24 | 1.35 | 1.0 | 1.70 |
| P (%) | .80 | .87 | .90 | .98 | 1.50 | 1.1 |
| Lysine (%) | 1.50 | 1.59 | 1.64 | 1.72 | 1.8 | 1.88 |
| Methionine + Cys. | .86 | 1.30 | 1.7 | 1.65 | 2.0 | 2.50 |
| Fat (EE) (%) | 4.0 | 4.95 | 5.0 | 5.90 | 6.8 | 7.70 |

*The commercial premix (David Knight Product) supplied per kg ration: vit. A. 1500 I. U., vit. E 5mg; vit D₃ 3000 I. U., vit. K. 3mg; vit. B₁ 2mg; vit. B₂ 5.5mg; Niacin 25mg; vit B₁₂ 10ug; choline 120mg; manganese 5.2mg; molybdenums 240mg; zinc 25mg; copper 2.6g; folic acid 2mg; iodine 2mg; molybdenums 240mg; D. N. O. T. 60mg; Antioxidant 56mg; iron 5g; pantothenic acid 10ug; Biotin 30.5g; amprolium 12.5mg; neoterramycin (tetracycline) 100mg; plus limestone flour.

Table 3: Composition of broiler finisher diets with graded levels of sesame meal. levels of sesame meal in diets (%)

| Ingredients | LEVELS OF SESAME MEAL IN DIETS (%) | | | | |
|-----------------------------|------------------------------------|---------------|---------------|---------------|---------------|
| | Control | 10% | 15% | 20% | 30% |
| Maize | 62.25 | 58.25 | 56.25 | 54.25 | 50.50 |
| Sesame meal | - | 10.00 | 15.00 | 20.00 | 30.00 |
| Soybean meal | 34.00 | 28.00 | 25.00 | 22.00 | 15.75 |
| Bone meal | 3.00 | 3.00 | 3.00 | 3.0 | 3.00 |
| Common salt | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Vit/Min Premix * | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Calculated Analysis: | | | | | |
| Crude protein (%) | 20.40 | 20.40 | 20.40 | 20.40 | 20.40 |
| M. E. (Kcal/kg) | 2890 | 2902.0 | 2882.0 | 2915.0 | 2885.0 |
| Ca (%) | 1.0 | 1.20 | 1.24 | 1.35 | 1.50 |
| P (%) | .80 | .88 | .90 | .96 | 1.0 |
| Lysine (%) | 1.30 | 1.37 | 1.40 | 1.44 | 1.54 |
| Methionine + Cys.(%) | .75 | 1.20 | 1.34 | 1.56 | 1.97 |
| Fat (EE) (%) | 3.97 | 4.87 | 5.33 | 5.79 | 6.75 |

*The commercial premix (David Knight Product) supplied per kg ration as in table 2.

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Table 4: Performance of broilers fed graded levels of sesame meal in corn-soybean meal diets. (0-4 weeks)

| Level of Sesame Meal (%) | Av. wt. of broiler At wk. 4 (g) | Av. Wt. of gain per bird (g) | Av. Wt. of gain/bird day (g) | Av. Feed consumed (g) | Feed/gain ratio |
|--------------------------|---------------------------------|------------------------------|------------------------------|-----------------------|--------------------|
| 0 | 592.58 ^{ab} | 554 ^{ab} | 19.77 ^{ab} | 015.87 ^{ab} | 1.98 ^{ab} |
| 10 | 585.43 ^{ab} | 542.23 ^{ab} | 19.47 ^{ab} | 962.27 ^{ab} | 1.80 ^{ab} |
| 15 | 650.0 ^a | 608.90 ^{ab} | 21.76 ^{ab} | 904.2 ^{ab} | 1.47 ^{bc} |
| 20 | 500.86 ^{cd} | 469.43 ^{cd} | 16.65 ^{cd} | 832.70 ^{cd} | 1.53 ^b |
| 30 | 551.95 ^{bc} | 511.25 ^{bc} | 18.23 ^{bc} | 841.45 ^{bc} | 1.83 ^{ab} |
| 40 | 408.15 ^e | 367.23 ^e | 13.10 ^e | 620.23 ^e | 1.38 ^c |
| S.E.M. | 34.88 | 35.13 | 1.26 | 63.14 | 0.11 |

^{abc} Means within the same column with the same superscript are not significantly different ($P > 0.05$) while means not having the same letter superscript are significantly different.
S. E. M. = Standard error of the means.

in broiler diets gave excellent body weights gains and low mortality.

Record on feed consumption showed that there was no significant ($P > 0.05$) difference in feed consumed between birds fed control, 10 and 15 percent sesame meal diets. However, birds on 15% sesame meal diet significantly ($P < 0.05$) consumed (904.2g) more feed than those on 20, 30 and 40 percent sesame meal diets. Reduced feed consumption of chicks fed on sesame meal diets at relatively high levels of sesame meal above 15% could be due to high fat levels in the rations. Because broiler chicks consume feed to meet their energy requirements (Scott *et al.*, 1982), the chicks fed on 20, 30 and 40 percent sesame meal diets had higher fat contents of 5.9, 6.8, 7.7% respectively than the recommended level of 3.0% by Armas and Chicco (1972). These chicks consumed significantly ($P < 0.05$) less feed compared to control, 10 and 15 percent sesame meal diets.

Feed conversion (feed/gain) data indicated that chicks on 40% sesame meal significantly ($P < 0.05$) had superior feed conversion when compared with birds on control, 10; 20 and 30 percent, except for the group on 15% sesame meal diet which were not significantly different in their feed/gain records.

Performance of birds fed experimental diets (5-8 weeks).

Results on the performance of birds fed experimental diets at 5-8 weeks of age are presented in table 5. Data showed that birds, which fed on 15% sesame meal, had significantly ($P < 0.05$) higher weight gain (803.37g) than those fed on control and other dietary treatments. Earlier work done by Balloun (1980) recommended 10% sesame meal inclusion in broiler diet for good weight gains. This finding could probably be due to higher level of protein in sesame meal used in their trial.

There was no significant ($P > 0.05$) difference in feed consumption between birds fed the control,

Table 5: Performance of broilers fed graded levels of sesame meal in corn-soybean meal diets. (5-8 weeks)

| Level of sesame meal (%) | Av. wt. gain per bird (g) | Av. wt. gain/bird /day (g) | Av. feed consumed (g) | Feed/gain ratio |
|--------------------------|---------------------------|----------------------------|-----------------------|--------------------|
| 0 | 699.93 ^{ab} | 24.97 ^{ab} | 1534.67 ^a | 1.80 ^a |
| 10 | 495.20 ^{cd} | 21.23 ^{bc} | 1277.10 ^a | 1.83 ^a |
| 15 | 803.37 ^{ab} | 28.70 ^{ab} | 1200.70 | 1.98 ^a |
| 20 | 554.03 ^{bc} | 21.00 ^{cd} | 791.25 ^b | 1.53 ^{bc} |
| 30 | 568.03 ^{bc} | 21.13 ^{bc} | 1136.37 ^a | 1.47 ^{bc} |
| 40 | 544.16 ^{bc} | 19.43 ^{cd} | 696.38 ^b | 1.39 ^c |
| S.E.M. | 77.17 | 1.76 | 142.50 | .78 |

a., b., c., d. Means within the same column with the same superscript are not significantly different ($P > 0.05$).
S. E. M. = Standard error of the means.

10 and 15 percent sesame meal diets. Birds fed 20 and 40 percent sesame meal diets had the lowest ($P < 0.05$) feed consumption values. With respect to feed conversion, birds on the 40% sesame meal diets significantly ($P < 0.05$) had better feed conversion than the groups on control, 10 and 15 percent experimental diets but was not significantly ($P > 0.05$) different from the groups on 20 and 30 percent sesame meal diets.

Reduced feed consumption, by birds on diets above 15% sesame inclusion levels could be due to increased levels of dietary fat and methionine. Though these birds had poor weight gains compare to birds on other dietary treatments, it appeared they made use of the little feed consumed and thus had better feed conversion ratio than birds on low levels of sesame meal diets.

Performance of Broiler Birds fed Experimental Diets (0-8 weeks).

Data on the performance of birds within the period of 0-8 weeks of age is presented in table 6. Results indicate that there were no significant

($P > 0.05$) differences in weight gains between birds fed the control, 10, 15 percent sesame meal diets. The 15% sesame meal inclusion in experimental diet significantly ($P < 0.05$) supported faster weight gain (1435.80g) than the groups on control (1269.53g) and also the birds (1204.52g) fed 10% sesame meal diets. There was no significant difference in weight gains between birds on 30 and 40 percent sesame meal diets. However, the group of birds on 30 and 40% sesame meal diets, performed significantly ($P < 0.05$) lower than the groups on other dietary treatments. It is worthy of note, the consistency coupled with outstanding performance of birds on 15% sesame meal, and also the satisfactory weight gains of birds on the 20% sesame meal inclusion in diets. This could be due to the ability of the older birds to utilize more dietary fat as a result of their increased physical activity and metabolic rate. Consequently they consumed more feed and methionine for enhanced growth and weight gains. The depression in weight gains by birds fed sesame meal level above 20% as observed in this study is in agreement with an earlier report by Scott *et al.*, (1982), which

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Table 6: Performance of broilers fed graded levels of sesame meal in corn-soybean meal diets. (0-8 weeks)

| Level of sesame meal (%) | Av. wt. of broiler at wk. 4 (g) | Av. Wt. of gain per bird (g) | Av. Wt. Of gain/bird day (g) | Av. Feed consumed (g) | Feed/gain ratio |
|--------------------------|---------------------------------|------------------------------|------------------------------|-----------------------|-------------------|
| 0 | 1307.93 ^{ab} | 1269.52 ^{ab} | 23.366 ^{ab} | 2550.43 ^a | 2.00 ^a |
| 10 | 1251.72 ^{ab} | 1204.52 ^{ab} | 21.866 ^{ab} | 2239.3 ^b | 1.85 ^a |
| 15 | 1477.5 ^c | 1435.8 ^c | 25.633 ^c | 2104.9 ^b | 1.49 ^b |
| 20 | 1346.62 ^{ab} | 1306.32 ^{ab} | 23.333 ^{ab} | 2007.28 ^b | 1.53 ^b |
| 30 | 1157.62 ^b | 1116.37 ^b | 19.933 ^b | 1977.81 ^b | 1.83 ^a |
| 40 | 968.116 ^d | 927.399 ^d | 16.533 ^d | 1399.65 ^c | 1.49 ^b |
| S.E.M. | 108.68 | 107.88 | 1.94 | 125.776 | 0.37 |

*Means within the same column with the same superscript are not significantly different at 0.05 level of probability ($P > 0.05$)

†Different means not having the same letter superscript are significantly different at 0.05 probability ($P < 0.05$).

*S. E. M. =Standard error of the means.

observed lower final body weight of broiler birds at 8 weeks using 24% level of sesame meal inclusion in diets. This seems to indicate that inclusion of sesame meal in diets of broilers above 20% level has detrimental effect on growth performance.

Feed consumption data (table 6) showed that birds on control diet significantly consumed more feeds than bird on other dietary treatments. It appeared that the higher the level of sesame meal inclusion in diets, the lower the feed intake. This observation is probably not surprising because as the sesame meal levels increased, dietary fat level increased also. Since dietary fat is a high source of energy and chickens consume feed first to meet their energy requirements (Scott *et al.*, 1982), birds fed high levels of sesame meal inclusion consumed significantly less ($P < 0.05$) feed compared to other diets in the trial.

Feed conversion of birds fed the dietary treatments at 8 weeks showed no particular trend. However, except for birds on 10% and 30%

sesame meal diets, all other groups on dietary treatments, significantly ($P < 0.05$) indicated better-feed conversion ratio than the groups on control diet.

Conclusion

It was concluded from this study that the optimum level of sesame meal inclusion in broiler diets for maximum performance was 15 percent. It appears practicable therefore, to incorporate up to 15 percent sesame meal in broiler diets without adverse effects on growth, provided the rations contained other sources of protein with adequate levels of lysine .

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