

EFFECT OF FEEDING SESAME OIL CAKE (*Sesamum indicum* L.) ON TIBIA AND BREAST MEAT COMPOSITION IN BROILERS*

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ABSTRACT

A study was conducted to evaluate the effect of feeding sesame oil cake in commercial broilers for their production performance, tibial weight, tibial composition and proximate composition of breast meat. Day-old chicks (n=240), randomly allotted to eight treatment groups in duplicate of fifteen chicks each, were used in the study of 6 weeks. The sesame oil cake was included at different levels viz., 0(T₁), 5(T₂), 7.5(T₃), 10(T₄), 12.5(T₅), 15(T₆), 17.5(T₇) and 20%(T₈) in broiler rations by replacing the protein concentrate mixture containing 41% rice polish, 25% deoiled groundnut cake, 30% soyabean meal and 4% rice bran oil. At the end of 6 weeks, there was a linear increase in weight gain as the level of sesame oil cake increased from 0 - 15% and the weight gain (P< 0.05) and feed efficiency was superior at 15% sesame oil cake inclusion level (1495 g and 1.98) compared to control diet (1379 g and 1.99). The tibial weight (1.19 to 1.32% live body weight), tibial ash (40.54 to 43.44%), calcium (28.30 to 32.45%), phosphorus (11.88 to 16.77%) and the composition of breast meat among the treatment groups did not differ, which indicated that tibial weight, tibial composition and proximate composition of breast meat were not affected due to feeding of sesame oil cake.

Key Words: Sesame oil cake, Broilers, Production performance, Tibia, Breast meat, Proximate composition.

INTRODUCTION

The sesame seed contains about 50% oil and 20-25% protein (Vaughan, 1970). The residue sesame oil cake contains on an average 32% crude protein, 8-10% oil, total oil and albuminoids of 40-42% (Mehta, 2000) and rich in essential amino acids namely methionine and cystine (Johri *et al.*, 1988). Sesame oil cake has been used as an excellent protein supplement for dairy cattle. Its usage as

a protein supplement for poultry has been very limited. Hence, it was proposed to evaluate the feeding value of sesame oil cake on tibia and breast meat composition in commercial broilers.

MATERIALS AND METHODS

Two hundred and forty day-old commercial Vencobb broiler chicks were weighed, wing banded individually and randomly allotted

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to eight treatment groups in duplicate of fifteen chicks each. All the chicks were reared in well prepared deep litter pens, following standard management practices uniformly for all the treatments. Throughout the experimental period, feed and water were provided *ad libitum*.

The dietary treatment groups contained 0(T₁), 5(T₂), 7.5(T₃), 10(T₄), 12.5(T₅), 15(T₆), 17.5(T₇) and 20%(T₈) levels of inclusion of sesame oil cake replacing the protein concentrate mixture (Table 1) on part by part basis in an isocaloric and isonitrogenous starter (0 - 3 weeks) and finisher (4 - 6 weeks) mashes (Tables 2 and 3). Records of daily feed intake, mortality, if any, weekly weight gain and feed efficiency were maintained throughout the experimental period (0-6 weeks).

At the end of the experiment (0 - 6 weeks), three birds per replicate, totally six birds per treatment were selected randomly and slaughtered (Gracey, 1986) for carcass evaluation. The right and left tibial bones of each bird were collected, defatted and ashed in muffle furnace to estimate the tibial ash, calcium and phosphorus content. Breast muscle samples of each treatment were mixed and analyzed for moisture, crude protein, ether extract, total ash, calcium and phosphorus content as per standard procedure (AOAC, 1990). The data were subjected to statistical analysis as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

The sesame oil cake were included at different levels *viz.*, 0(T₁), 5(T₂), 7.5(T₃), 10(T₄), 12.5(T₅), 15(T₆), 17.5(T₇) and 20%(T₈) in broiler rations and performance of broilers were assessed in terms of weight gain, feed intake and feed efficiency during 0-6 weeks period and the results are presented in Table 4.

At the end of 6 weeks, no significant difference in weight gain (Table 4) was recorded

between T₁, T₂, T₃ and T₄ groups. However, significantly ($P < 0.05$) higher weight gain was observed in T₆ group wherein sesame oil cake was included at 15% level as compared to T₁, T₂ and T₈ groups. But marginally higher weight gain was recorded in T₆ group as compared to T₃, T₄, T₅ and T₇ groups. As compared to the control group (T₁) the weight gain of other groups (T₆ and T₇) were found to be superior. Similar observation was recorded by Baghel and Netke (1987) in broilers fed 23.5% sesame meal and 28.2% soyabean extraction for 6 weeks period. However, significantly ($P < 0.05$) lower weight gain was recorded in T₈ group as compared to T₅, T₆ and T₇ groups, which received 20% sesame oil cake alone without other protein concentrate mixture. Thus the improvement in weight gain in T₆ group could be the results of supplementary effect of sesame oil cake with the other two vegetable proteins (soyabean meal and groundnut deoiled cake). Similar increase in weight gain was recorded by Gohl (1981) in chick diet. A reduction in weight gain was recorded in T₈ group in this study, which could be attributed to lower feed intake.

The cumulative feed intake of broiler birds fed different level of sesame oil cake is furnished in Table 4. At the end of 6 weeks, no significant variation in feed intake was observed among various treatment groups during 0-6 weeks periods. But, numerically higher feed intake was observed in T₆ group as compared to other treatment groups. Similar observation was recorded by Baghel and Netke (1987) in broilers fed different levels of sesame meal. The feed consumption was lower in T₈ group, but the difference was not statistically significant as compared to other treatment groups throughout the experiment. Sesame meal is known to have a high phytic acid content (Toma et al., 1979) which might have contributed to lower feed intake (Mamputu and Buhr, 1995) in T₈ groups. Further, on analysis of sesame oil cake for oxalate content

was observed that sesame oil cake contained 4.21% of oxalate, which might have also resulted lower feed consumption in T₈ groups.

This study showed no significant variation in feed efficiency and protein efficiency ratio among various treatment groups during the period of six weeks (Table 4). Similar observation was recorded by Dagher et al. (1967) in broilers fed sesame meal replacing 50% of soyabean meal. The data on weight gain, feed consumption, feed efficiency and protein efficiency ratio reveals that inclusion of sesame oil cake at 15% (T₆) level in broiler diet was found to be advantageous.

The mean values of tibial weight and tibial composition (Table 5) namely ash, calcium and phosphorus contents were not statistically significant among various treatment groups tested, which indicated that tibial weight and tibial major mineral composition were not affected due to feeding of sesame oil cake.

The mean values of proximate composition of breast meat namely moisture, crude protein, ether extract, total ash, calcium and phosphorus content of breast meat without skin for broilers are presented in Table 6. These values were within the range reported by Macrae et al. (1993) in broilers.

CONCLUSION

From the results of the present study, it can be concluded that inclusion of sesame oil cake replacing protein concentrate mixture in broiler starter and finisher ration was found to be advantageous without affecting the weight gain, feed efficiency, tibial weight, tibial composition and composition of breast meat up to 15% (T₆) inclusion level.

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Table 1
Ingredient and nutrient compositions (% DM) of protein concentrate

| Ingredient | Composition |
|---------------------------------|-------------|
| Rice polish | 41.00 |
| Deoiled groundnut cake | 25.00 |
| Soyabean meal | 30.00 |
| Rice bran oil | 4.00 |
| Total | 100.00 |
| Nutrient composition | |
| Dry matter | 92.31 |
| Crude protein | 30.08 |
| Crude fibre | 10.13 |
| Ether extract | 11.48 |
| Total ash | 9.42 |
| Nitrogen free extract | 38.89 |
| Acid insoluble ash | 3.36 |
| Calcium | 0.86 |
| Total phosphorus | 0.81 |
| Sodium chloride | 0.10 |
| Available phosphorus* | 0.15 |
| Methionine* | 0.39 |
| Lysine* | 1.36 |
| Metabolizable energy* (kcal/kg) | 2848.00 |

* Calculated values.

Table 2
Ingredient and nutrient compositions (% DM) of broiler starter mash (0-3 weeks)

| Ingredients | Per cent level of sesame oil cake inclusion in the ration | | | | | | | |
|--|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | 0.0 | 5.0 | 7.5 | 10.0 | 12.5 | 15.0 | 17.5 | 20.0 |
| Maize | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| Soyabean meal | 24.00 | 24.00 | 24.00 | 24.00 | 24.00 | 24.00 | 24.00 | 24.00 |
| Deoiled rice bran | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| Protein concentrate | 20.00 | 15.00 | 12.50 | 10.00 | 7.50 | 5.00 | 2.50 | 0.00 |
| Sesame oil cake | 0.00 | 5.00 | 7.50 | 10.00 | 12.50 | 15.00 | 17.50 | 20.00 |
| Dicalcium phosphate | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Calcite | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Vitamin AB ₂ D ₃ K (g) (1) | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Vitamin B complex (g)(2) | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Coccidiostat (g) (3) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| L.Lysine hydrochloride (99%) (g) | 160.00 | 180.00 | 190.00 | 200.00 | 210.00 | 220.00 | 240.00 | 250.00 |
| DL.Methionine (99%) (g) | 260.00 | 210.00 | 190.00 | 170.00 | 150.00 | 130.00 | 110.00 | 90.00 |
| Choline chloride(50%) (g) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Trace minerals (g) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Sodium chloride (g) | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 |
| Nutrient composition | Supplied per kg of diet :- Vitamin A – 8,250 IU, Vitamin B ₁ – 5 mg, Vitamin D ₃ – 1200 IU and Vitamin K – 1 mg, Thiamine – 1 mg, Pyridoxine – 2 mg, Cyanocobalamin – 15 mcg, vitamin E – 10 mg, niacin – 15 mg, calcium D pantothanate – 10 mg, folic acid – 1 mg. | | | | | | | |
| Dry matter | 90.18 | 90.50 | 90.42 | 90.38 | 90.26 | 90.63 | 90.68 | 90.72 |
| Crude protein | 52.74 | 51.87 | 52.59 | 51.90 | 52.93 | 53.09 | 52.25 | 52.82 |
| Crude fibre | 5.54 | 5.67 | 5.71 | 5.60 | 5.77 | 5.27 | 5.48 | 5.06 |
| Ether extract | 5.78 | 3.66 | 4.21 | 3.74 | 3.94 | 5.29 | 5.47 | 2.36 |
| Total ash | 7.27 | 7.65 | 7.98 | 8.24 | 7.54 | 7.98 | 8.57 | 8.62 |
| Nitrogen free extract | 58.15 | 58.15 | 58.15 | 58.15 | 58.15 | 58.15 | 58.15 | 58.15 |
| Acid insoluble ash | 1.47 | 1.33 | 1.39 | 1.28 | 1.17 | 1.06 | 1.09 | 10.03 |
| Calcium | 1.31 | 1.31 | 1.18 | 1.29 | 1.31 | 1.51 | 1.62 | 1.84 |
| Total phosphorus | 0.59 | 0.62 | 0.67 | 0.71 | 0.68 | 0.66 | 0.67 | 0.71 |
| Sodium chloride | 0.21 | 0.27 | 0.28 | 0.34 | 0.40 | 0.46 | 0.46 | 0.50 |
| Available phosphorus* | 0.46 | 0.47 | 0.47 | 0.48 | 0.48 | 0.49 | 0.49 | 0.50 |
| Methionine* | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Lysine* | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| Metabolizable energy* (kcal/kg) | 2832.50 | 2835.00 | 2836.25 | 2837.50 | 2838.75 | 2840.00 | 2841.25 | 2842.50 |

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Table 3
Ingredient and nutrient compositions (% DM) of broiler finisher mash (4-6 weeks)

| Ingredients | Per cent level of sesame oil cake inclusion in the ration | | | | | | | |
|--|---|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | 0.0 | 5.0 | 7.5 | 10.0 | 12.5 | 15.0 | 17.5 | 20.0 |
| Maize | 56.00 | 56.00 | 56.00 | 56.00 | 56.00 | 56.00 | 56.00 | 56.00 |
| Soyabean meal | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | 20.00 |
| Deoiled rice bran | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Protein concentrate | 20.00 | 15.00 | 12.50 | 10.00 | 7.50 | 5.00 | 2.50 | 0.00 |
| Sesame oil cake | 0.00 | 5.00 | 7.50 | 10.00 | 12.50 | 15.00 | 17.50 | 20.00 |
| Dicalcium phosphate | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Calcite | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| Total | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Vitamin AB ₂ D ₃ K (g) (1) | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 |
| Vitamin B complex (g)(2) | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Coccidiostat (g) (3) | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| L.Lysine hydrochloride (99%) (g) | 0.00 | 30.00 | 40.00 | 50.00 | 60.00 | 80.00 | 90.00 | 100.00 |
| DL.Methionine (99%) (g) | 110.00 | 60.00 | 40.00 | 20.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Choline chloride(50%)(g) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Trace minerals (g) (4) | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| Sodium chloride (g) | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 | 400.00 |
| Nutrient composition | | | | | | | | |
| Dry matter | 91.11 | 91.18 | 91.30 | 91.09 | 91.02 | 91.05 | 91.05 | 91.03 |
| Crude protein | 20.91 | 21.34 | 21.82 | 21.73 | 21.78 | 22.25 | 21.89 | 21.95 |
| Crude fibre | 5.85 | 4.31 | 5.25 | 5.49 | 5.20 | 4.74 | 4.85 | 5.58 |
| Ether extract | 4.20 | 4.64 | 4.58 | 3.51 | 4.75 | 5.30 | 5.67 | 3.93 |
| Total ash | 7.44 | 8.03 | 8.40 | 7.93 | 9.16 | 8.56 | 8.39 | 8.22 |
| Nitrogen free extract | 61.60 | 61.68 | 59.95 | 61.34 | 59.11 | 59.15 | 59.20 | 60.32 |
| Acid insoluble ash | 1.38 | 0.87 | 1.53 | 1.24 | 1.54 | 1.26 | 1.24 | 1.23 |
| Calcium | 1.73 | 1.73 | 1.95 | 2.05 | 1.87 | 1.75 | 1.63 | 1.82 |
| Total phosphorus | 0.74 | 0.81 | 0.74 | 0.72 | 0.92 | 0.77 | 0.79 | 0.80 |
| Sodium chloride | 0.54 | 0.58 | 0.73 | 0.74 | 0.67 | 0.77 | 0.77 | 0.82 |
| Available phosphorus* | 0.45 | 0.46 | 0.46 | 0.47 | 0.47 | 0.48 | 0.48 | 0.49 |
| Methionine* | 0.35 | 0.35 | 0.35 | 0.35 | 0.36 | 0.38 | 0.40 | 0.43 |
| Lysine* | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Metabolizable energy* (kcal/kg) | 2900.00 | 2902.00 | 2903.00 | 2905.00 | 2906.00 | 2907.00 | 2908.00 | 2909.00 |

1. Supplied per kg of diet :- Vitamin A – 8,250 IU, Vitamin B₂ – 5 mg, Vitamin D₃ – 1200 IU and Vitamin K – 1 mg.
2. Supplied per kg of diet :- Thiamine – 1 mg, pyridoxine – 2 mg, cyanocobalamine – 15 mcg, vitamin E – 10 mg, niacin – 15 mg, calcium D pantothanate – 10 mg, folic acid – 1 mg.
3. Coccidiostat - contained 3-5, dinitro-O-toluamide - 25%, ethopabate – 1.6%.
4. Supplied per kg of diet :- Manganese – 180 mg, zinc – 140 mg, iron – 40 mg, iodine – 4 mg, copper 30 mg, cobalt 2 mg

* Calculated values.

Table 4

Effect of inclusion of sesame oil cake on weight gain, feed consumption, feed efficiency, protein intake and protein efficiency ratio (P.E.R) in broilers at 6 weeks of age

| Level of sesame oil cake | Weight gain (g) ^{* #} | Feed intake (g) | Feed efficiency | Protein intake (g) | P.E.R |
|---|----------------------------------|------------------|-----------------|-------------------------------|----------------|
| Control diet (T ₁) | 1379 ^{ab} ± 143.98 | 2736 ± 12.64 | 1.99 ± 0.02 | 530 ^a ± 2.04 | 2.60 ± 0.01 |
| 5% sesame oil cake (T ₂) | 1402 ^{abc} ± 167.05 | 2848 ± 170.98 | 2.03 ± 0.05 | 556 ^{ab} ± 33.36 | 2.52 ± 0.15 |
| 7.5% sesame oil cake (T ₃) | 1422 ^{abcd} ± 142.48 | 2825 ± 115.10 | 1.99 ± 0.01 | 566 ^{abc} ± 22.95 | 2.51 ± 0.11 |
| 10% sesame oil cake (T ₄) | 1436 ^{abcd} ± 157.83 | 2861 ± 42.65 | 1.99 ± 0.00 | 566 ^{abc} ± 8.44 | 2.54 ± 0.04 |
| 12.5% sesame oil cake (T ₅) | 1450 ^{bcd} ± 160.36 | 2905 ± 47.91 | 2.02 ± 0.10 | 582 ^{bc} ± 9.71 | 2.49 ± 0.04 |
| 15% sesame oil cake (T ₆) | 1495 ^d ± 179.65 | 2961 ± 39.29 | 1.98 ± 0.02 | 604 ^c ± 7.98 | 2.48 ± 0.04 |
| 17.5% sesame oil cake (T ₇) | 1461 ^{cd} ± 139.99 | 2891 ± 100.70 | 1.98 ± 0.01 | 578 ^{bc} ± 20.12 | 2.53 ± 0.08 |
| 20% sesame oil cake (T ₈) | 1357 ^a ± 131.19 | 2705 ± 7.21 | 2.00 ± 0.01 | 545 ^{ab} ± 1.44 | 2.49 ± 0.01 |

Each value is a mean of 2 observations.

Mean of 30 observations.

Means bearing the same superscript in a column do not differ significantly * (P<0.05)

Table 5

Effect of inclusion of sesame oil cake on tibial weight and composition in broiler (0-6 weeks) rations

| Treatment | Tibial weight (% live body weight) | Tibial composition (% DMB) | | |
|------------------------|------------------------------------|----------------------------|---------------|--------------|
| | | Ash | Calcium | Phosphorus |
| T ₁ (0%) | 1.25 ± 0.12 | 41.87 ± 2.38 | 31.31 ± 6.40 | 14.83 ± 3.17 |
| T ₂ (5%) | 1.25 ± 0.14 | 43.34 ± 1.54 | 32.45 ± 8.14 | 14.07 ± 3.48 |
| T ₃ (7.5%) | 1.23 ± 0.15 | 43.37 ± 1.46 | 28.30 ± 4.68 | 11.88 ± 1.51 |
| T ₄ (10%) | 1.32 ± 0.06 | 42.50 ± 1.48 | 31.17 ± 8.43 | 13.91 ± 3.99 |
| T ₅ (12.5%) | 1.20 ± 0.16 | 43.44 ± 1.70 | 34.28 ± 7.33 | 16.77 ± 2.95 |
| T ₆ (15%) | 1.31 ± 0.09 | 42.02 ± 2.46 | 31.70 ± 12.59 | 12.85 ± 4.27 |
| T ₇ (17.5%) | 1.19 ± 0.12 | 40.54 ± 2.14 | 32.00 ± 9.10 | 14.62 ± 5.48 |
| T ₈ (20%) | 1.22 ± 0.08 | 43.40 ± 2.01 | 28.86 ± 3.50 | 13.00 ± 1.91 |

Each value is a mean of 6 observations

Table 6

Effect of inclusion of sesame oil cake in broiler (0-6 weeks) rations on proximate composition of breast meat without skin (% wet-weight basis)

| Treatment | Moisture | Crude protein | Ether extract | Total ash | Calcium | Phosphorus |
|------------------------|-----------------|----------------------|----------------------|------------------|----------------|-------------------|
| T ₁ (0%) | 65.75 | 22.82 | 1.11 | 1.29 | 0.10 | 0.08 |
| T ₂ (5%) | 60.36 | 23.43 | 1.13 | 1.38 | 0.09 | 0.04 |
| T ₃ (7.5%) | 64.09 | 23.08 | 1.04 | 1.62 | 0.10 | 0.07 |
| T ₄ (10%) | 66.52 | 23.31 | 0.91 | 1.24 | 0.20 | 0.04 |
| T ₅ (12.5%) | 58.15 | 22.58 | 0.74 | 1.46 | 0.09 | 0.10 |
| T ₆ (15%) | 58.64 | 23.07 | 1.16 | 1.32 | 0.14 | 0.06 |
| T ₇ (17.5%) | 61.26 | 23.09 | 0.80 | 1.85 | 0.09 | 0.05 |
| T ₈ (20%) | 61.81 | 23.49 | 1.21 | 1.28 | 0.10 | 0.04 |