# Effects of feeding different levels of sesame oil cake on performance and digestibility of Awassi lambs

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**Abstract**
This experiment investigated the effect of feeding different levels of sesame oil cake on the intake and digestibility of DM, CP, crude fiber, and crude fat in Awassi fattening lambs. Sesame oil cake was incorporated into lamhs' rafions at levels of 10 and 20% to replace similar percentages of barley and soybean. The results showed that the high level of sesame oil cake inclusion decreased DM and protein intake, however, it increased ($P<0.05$) crude fiber, crude fat and copper intake. Addition of 20% sesame oil cake also increased ($P<0.05$) the digestibility of CP and crude fiber. Sesame oil cake resulted in more daily gain and better feed conversion efficiency compared to control. The results indicated that addition of sesame oil cake to Awassi lambs' rations had some economical advantages in digestibility and performance compared to traditional fattening rations. The higher cost of gain was in lambs fed the commercial fattening feed. Sesame oil cake reduced ($P<0.05$) cost of gain. This was because of the low costs of rations incorporated with sesame oil cake.

## 1. Introduction

In the Palestinian National Authority feeding costs make up for more than 70% of total production costs in any livestock operation (Abo Omar, 1998). Therefore, it is essential to incorporate local raw materials and farm by-products in the rations of animals as much as possible ( Shqueir and Qwasmi, 1994).

Sesame oil cake is one by-product of local farming that is available. It is derived from sesame seed pressing for oil. About 10,000 tons of the material are produced each year (Ministry of Agriculture, 1999).

The chemical composition of sesame oil cake varies according to the method of processing the sesame seeds (mechanical or solvent extraction). The reported DM content ranges from 83 to 96%, while the ranges for CP, ash, ether extract, NFE and crude fiber are 23–46%, 7.5–17.5%, 1.4–27%, 25–31% and 5–12% for these nutrients, respectively (FAO, 1990).

Little information is available on the quality of sesame oil cake in Palestinian National Authority and there is little information about the outcome of feeding this material to ruminants. Ryu et al. (1998a) reported that incorporation of sesame oil cake in rations had positive effects on calves' performance. Similarly, sesame oil cake tended to improve feeding quality of rice straw when fed to steers ( Ryu et al., 1998b). Sesame oil cake, a relatively good source of CP, can replace dried poultry excreta in calves' rations without causing harmful effects ( Khan et al., 1998); sesame oil cake improved DMI and OM, CP, crude fiber and ether extract digestibility.

There is no information about the effect of feeding sesame oil cake on lambs performance and digestibility.

This research aimed at investigating the chemical composition of local sesame oil cake, its effect on the performance of Awassi lambs and on the digestibility of diets containing the cake.

## 2. Materials and methods

Eighteen male Awassi lambs were obtained from a commercial market soon after reaching weaning weight. At the experimental site, the lambs were treated against internal and external parasites and vaccinated against enterotoxemia. Animals were stratified into weight categories and then randomly divided into three groups of six lambs. Lambs were fed their rations individually in separated pens for 63 days.

Raw sesame oil cake was collected from a local sesame pressing factory (Nablus, Palestinian National Authority) during the summer of 2000. The fresh material was transported to the experimental site. It was spread on a large plastic sheet for sun-drying for 3 days. The material was covered during the night to avoid moisture accumulation.

The experimental rations were formulated to meet NRC (1994) requirements.

Lambs in the first group were fed a commercial fattening feed, Lambs Feed #2 (control diet). The second and third groups were fed the control diet to which had been added sesame oil cake at rates of 10 and 20% (Table 1). Sesame oil cake was added to replace similar amounts of soybean meal and barley. Soybean meal was removed to ensure that all diets contained the same amount of protein.

Animals had free access to water and salt blocks. Daily feed intake and refused feeds were recorded. Feed samples were collected on a weekly basis for later analysis. Animals were observed for health problems.

Twenty-eight days after the start of the feeding trial, four lambs were taken randomly from each group and placed in metabolic crates. Lambs were adapted to crates for 4 days. The daily feed intake and faeces and urine outputs were recorded during the 7 day collection period. Samples of feeds, refusals, faeces and urine were collected and sampled for later analysis. The urine excreted by each animal during 24 h was collected using plastic jars (2 l) containing 20 ml of sulfuric acid and 500 ml of tap water. The collected urine was transferred to a container and diluted to 5 l with tap water. A 100 m1 sample was taken and kept in a 2 l bottle in a refrigerator. These samples of diluted urine obtained during the 7 days of collection were composited for each treatment in a 2 l bottle. Triplicate samples of 2 ml of urine were analyzed for nitrogen content.

Samples of feed and faeces were used to determine the following: DM, ash, CP, crude fat, crude fiber, Ca, P and Cu contents utilizing A.O.A.C. (1990) procedures. The NFB content was determined by difference.

The experimental design used was a complete randomized block design and all data were statistically analyzed by ANOVA using the SAS package (SAS, 1988).

## 3. Results and discussion

The composition of sesame oil cake is shown in Table 2. Values reported here differ when compared to those reported by other workers (FAO, 2000). The differences in composition observed can be explained by the method of processing the raw sesame seeds and type of sesame seeds. Similar differences were observed in the composition of olive cake as a result of pressing procedure of olive fruits ( Rabayaa, 2000). The variation

in crude fat, for example, was due to the partially left fat in the cake after being extracted by some methods of extraction.

The intake of dry matter and nutrients are shown in Table 3. Sesame oil cake reduced, but not significantly, the intake of DM by 4 and 2% for lambs consuming 10 and 20% sesame oil cake, respectively. A similar trend was observed in protein intake. However, intake of fiber and fat increased ($P<0.05$) by feeding sesame oil cake. The intake of DM and nutrients was similar to intake observed in many fattening studies utilizing different types of diets (Abo and Hammad).

The average final weights of lambs are shown in Table 4. The average weight was higher for lambs fed with 20% sesame oil cake compared to the other two groups. The average daily gain in the 10 and 20% sesame oil cake groups was higher ($P<0.05$) than in the control group (Table 4). Brand et al. (2001) reported similar gain in lambs when fed different levels of canola as a protein source.

The feed conversion efficiencies (Table 4) were lower than expected, especially in lambs fed commercial fattening diets ( Hammad, 2001). However, incorporation of sesame oil cake improved ($P<0.05$) feed efficiency (Table 4). The improvement of feed efficiency agreed with previous work with broilers and layers fed sesame seed cake ( Jacob et al., 1996).

The cost per kg gain was highest for lambs fed the commercial fattening feed (Table 4). Sesame oil cake reduced ($P<0.05$) cost of gain. This was because of the lower costs of rations containing sesame oil cake.

The digestibility of DM was not affected by inclusion of sesame oil cake in the diets (Table 5). Similar results were observed in calves when fed rations containing sesame oil cake (Khan and Hossain). Digestibility of CP and crude fiber was highest ($P<0.05$) for the diet containing 20% sesame oil cake (Table 5). These results agree with others reported by Hossain et al. (1989) and Khan et al. (1998).

## 4. Conclusion

The present results demonstrated the potential of feeding sesame oil cake in fattening rations for lambs. This raw material can replace 20% of soybean meal and barley. This is of advantage to farmers in areas where sesame cake is produced.

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## References

1. A.O.A.C., 1990. A.O.A.C., 1990. Official Methods of Analysis. Association of Official Analytical Chemists. 15th ed. Washington, DC.
2. Abo Omar and Gavoret, 1995. J. Abo Omar and L. Gavoret , Utilizing olive cake in fattening rations. Vet. Med. Rev. 146 4 (1995), pp. 273–276.
3. Abo Omar, 1998. Abo Omar, J., 1998. Feed industry in Palestine. Palestine Research Centre. Nablus, The Palestinian National Authority. Report No.18.22–27.

4. Brand et al., 2001. T. Brand, S. Van der Merwe and D. Young , Full fat canola as protein source in diets for finishing lambs. Anim. Feed Sci. Technol. 41 (2001), pp. 235–238. Article | PDF (58 K) | View Record in Scopus | Cited By in Scopus (1)
5. FAO, 1990. FAO, 1990. FAO home pages.
6. FAO, 2000. FAO, 2000. FAO home pages.
7. Hammad, 2001. Hammad, W., 2001. Evaluation of Awassi lambs fattening systems in Palestine. Master of Science Thesis. An Najah National University, Nablus, The Palestnian National Authority, pp. 34–37.
8. Hossain et al., 1989. M.M. Hossain, M.A. Huq, M. Saadulla and S. Akhtar , Effect of supplementation of rice straw diets with sesame oil cake, fish meal and mineral mixture on dry matter digestibility in goats. Indian J. Anim. Nutrition 6 1 (1989), pp. 44–47.
9. Jacob et al., 1996. J.P. Jacob, B.N. Mitran, P.N. Mbugua and R. Blair , The feeding value of Kenyan sorghum, sunflower seed cake and sesame seed cake for broilers and layers. Anim. Feed Sci. Tech. 61 (1996), pp. 41–56. Abstract | Article | PDF (1118 K) | View Record in Scopus | Cited By in Scopus (10)
10. Khan et al., 1998. M.J. Khan, M. Shahjalal and M.M. Rashid , Effect of replacing oil cake by poultry excreta on growth and nutrient utilization in growing bull calves. Asian–Australian J. Anim. Sci. 11 (1998), pp. 385–390. View Record in Scopus | Cited By in Scopus (2)
11. Ministry of Agriculture, 1999. Ministry of Agriculture, 1999. Records on various branches of plants crops, Palestinian National Authority. Ramalla, Palestinian National Authority, pp. 30–43.
12. NRC, 1994. NRC, 1994. Nutrition Requirements of Sheep. National Research Council, National Academy Press, Washington, DC, pp. 33–34.
13. Rabayaa, 2000. Rabayaa, I., 2000. Utilization of olive pulp in broilers rations. Master Thesis. An Najah National University, Nablus, Palestinian National Authority, pp. 45–48.
14. Ryu et al., 1998a. Y.W. Ryu, Y.D. Ko and S.M. Lee , Effect of feeding rice straw silage made with apple pomace. Korean J. Anim. Sci. 40 3 (1998a), pp. 235–244.
15. Ryu et al., 1998b. Y.W. Ryu, Y.D. Ko and S.M. Lee , Effects of mixing ratio of apple pomace, sesame oil meal and cage layer excreta on feed quality of rice straw silage. Korean J. Anim. Sci. 40 3 (1998), pp. 245–254.
16. SAS, 1988. SAS, 1988, SAS user’s guide. Statistics (version 5.18). SAS Inc. Cary, NC,USA.
17. Shqueir and Qwasmi, 1994. A. Shqueir and H. Qwasmi , effects of feeding olive pulp on performance of feedlot lambs. Bethlehem Univ. J. 13 (1994), pp. 90–91.

Table 1. Composition of the experimental rations (%)

| Group | Control | 10% | 20% |
|---|---|---|---|
| Ration composition | | | |
| Barley | 68.0 | 60.0 | 47.0 |
| Soy bean meal (SBM) | 13.0 | 10.0 | 6.0 |
| Dicalcium phosphate | 1.0 | 1.0 | 1.0 |
| Wheat Bran | 18.0 | 19.0 | 26.0 |
| Sesame oil cake | 0 | 10.0 | 20.0 |
| Chemical analysis | | | |
| DM | 88.0 | 87.8 | 87.9 |
| CP | 17.2 | 17.3 | 17.4 |
| Crude fiber | 6.1 | 6.7 | 7.6 |
| Crude fat | 2.5 | 5.1 | 7.2 |
| NFE | 62.2 | 58.7 | 55.7 |
| Cu (ppm) | 0.9 | 1.1 | 1.4 |
| Ca | 0.08 | 0.08 | 0.10 |
| P | 0.06 | 0.06 | 0.05 |

Table 2. Chemical composition of sesame oil cake (%) (as fed basis)

| Nutrient | % |
|---|---|
| DM | 95.7 |
| CP | 22.7 |
| Crude fiber | 11.9 |
| ADF | 33.0 |
| Crude fat | 26.9 |
| NFE | 31.0 |
| Ash | 7.5 |
| Ca | 0.60 |
| P | 0.10 |
| Cu (ppm) | 33.0 |

Table 3. Total dry matter and nutrient intake by lambs in the experiment (g)

| g per day | Control | 10% | 20% | S.E. |
|---|---|---|---|---|
| DM | 1402 | 1350 | 1370 | 9.8 |
| CP | 239.7 | 233.6 | 238.4 | 4.5 |
| Crude fiber | 85.1 | 90.45 | 104.1 | 2.7 |
| Crude fat | 35.1 | 67.5 | 98.6 | 1.8 |
| Cu (ppm) | 12.3 | 14.9 | 18.8 | 0.6 |
| Ca | 3.3 | 3.6 | 3.9 | 0.4 |
| P | 1.7 | 1.8 | 1.8 | 0.2 |

Table 4. Performance of Awassi lambs fed a control diet and diets containing 10% and 20% sesame oil cake mean (+S.E.)

| Item | Unit | Control | 10% | 20% |
|---|---|---|---|---|
| No. of lambs | # | 6 | 6 | 6 |
| Initial mean weight | kg | 39.8 (3.9) | 38.1(2.9) | 39.5 (3.0) |
| Final mean weight | kg | 50.7 (4.3) | 50.6 (3.9) | 52.5 (3.9) |
| Mean daily gain | g per day | 173 (32)*b* | 198 (35)*a* | 190 (40)*a* |
| Daily feed intake | kg per day | 1.40 | 1.35 | 1.37 |
| Feed conversion efficiency | kg diet/kg gain | 8.0 (1.0)*a* | 6.8 (1.3)*b* | 7.1 (1.7)*b* |
| Cost of total gain | US dollar | 20.8 (.1) | 18.36 (.12) | 19.8 (.12) |
| Cost of diets | dollar/kg diet | 0.239 | 0.216 | 0.186 |
| Cost of 1 kg gain | dollar/kg gain | 1.91 (.5)*a* | 1.46 (.6)*b* | 1.32 (.8)*b* |

Means in a row followed by different letters are different (P<0.05).

Table 5. Digestibility (%) of dry matter and nutrients by lambs

| | Control | 10% | 20% | S.E. |
|---|---|---|---|---|
| DM | 80.5 | 80.9 | 83.0 | 2.9 |
| CP | 78.8*b* | 79.7*b* | 84.6*a* | 2.1 |
| Crude fiber | 65.0*b* | 67.0*b* | 71.5*a* | 2.0 |

Means in a row followed by different letters are different (P<0.05).