Using of Different Kinds of Aromatic Oils with Feeding on Some Productive Traits in Awassi Lambs

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Abstract

This study was conducted in the animal farm of the College of Veterinary Medicine / Tikrit University for the period from 01/10/2019 to 31/12/2019 to investigate the effect of using different kinds of aromatic oils on some productive traits in Awassi lambs. Twenty Awassi lambs aged between 5-6 month and divided according to weight into four group and hens in an individual cages, the study lasted for 90 day. concentrate diet provided to the lambs at 3% of their body weight. the treatment were as follows: T1 was a control group without drenching, T2 drenched with sage oil, T3 drenched with clove oil and T4 drenched with laurel oil. drenching process was done manually by using water-soluble capsules each one contain 500 mg of oil, each lambs was given one capsule / day, which is pushed by using a plastic tube in to the beginning of esophagus. to study the effect of these oils on weight characteristics, body dimensions and wool characteristics. The results showed that there was no significant effect of the treatments on body weight characteristics. As for the measurements of the body dimensions after a month of the experiment, laurel oil, clove oil and sage oil had a significant effect on the chest circumference, the width of the body at the front, the width of the body at the back and BCS, and also the parameters had a significant effect on the measurements of body dimensions At the end of the experiment, the characteristics of the height of the body at the front, the height of the body at the back, the circumference of the chest, and the length of the body. As for the characteristics of the wool, the oils used led to a decrease in the percentage of clean wool and an increase in the length of the fiber compared to the control.

Keyword: Aromatic oils, Body weight, Body measurements, Wool traits.

1. Introduction

Feed additives are used to improve the nutritional efficiency of ruminants because of their positive effect and since the use of antibiotics as feed additives in ruminant diets was banned by the European Union after January 2006 [1] due to the health risks of residues in meat and milk. Desirable substitutes have been considered as alternative additives such as those of plant origin. Essential oils are generally recognized as safe for human and animal consumption and can be used as alternatives to antibiotics and growth promoters in the ruminant feed [2]. These compounds have been shown to positively affect rumen fermentation and improve the use of nutrients in ruminants [3]. Many medicinal plants possess various biological activities thus enhancing animal growth and immunity performance due to the presence of abundant active ingredients [4, 5].

Research on the use of medicinal plants and plant extracts and essential oils in animal production has developed all over the world recently. [6,7] referred that Medicinal plants improve digestibility, milk yield, economic efficiency, milk health and immunity in milk ewes. The effects of many plant essential oils on microbial fermentation in the rumen were investigated and the broad investigation of plant essential oils was more appropriate, due to their good effects on Rumen fermentation, such as reduced methane emissions, ammonia nitrogen concentrations, and an increase in the ratio of propionate to acetate [8,9]. [9] reported that the addition of clove resulted in a decrease in the concentration of rumen ammonia in the laboratory and an increase in the pH. In a study by [10] on essential oil (bay leaf) as feed added to feeding Holstein calves during the lactation period, daily body weight gain and feed conversion efficiency were obtained. [11] indicated that these oils strengthen the performance and immune system and gave an increase in buffalo calves weight during the same period. Also, [12] indicated that vegetable essential oils have a positive effect on total daily milk production, feed intake and feed conversion rate. Therefore, this study aimed to find out the effect of adding different kinds of aromatic oils (laurel, sage and clove) on body weight characteristics, body dimensions measurements, and wool characteristics for Awassi lamb.
2. Materials and Methods

The experiment was conducted in the animal farm of the College of Veterinary Medicine / University of Tikrit for a period from 1/10/2019 to 31/12/2019 in order to find out the effect of adding essential oils (laurel, sage and clove) on some productive traits. Awassi lambs were used in the experiment at the age of 5-6 months and the lambs were divided into four totals of 5 animals per treatment, the treatments were:

- Control treatment: without drenching
- First treatment: Laurel oil capsule 500 mg/ lamb/ day.
- The second treatment: clove oil, a capsule of 500 mg/ lamb/ day.
- The third treatment: sage oil, a capsule of 500 mg/ lamb/ day.

Drenching was by manually feeding the capsule to each animal at the beginning of the esophagus before feeding by a plastic tube inserted into the mouth. Lambs were fed a diet concentrated 3% of their body weight and coarse feed was provided to the animals to the extent of satiety. The live body measurements of the lambs included the circumference of the chest, which is calculated by using a measuring tape inserted 1 cm around the chest area of the animal and for the circumference of the abdomen, it was measured by the same tape that was mentioned previously and wrapped around the abdominal area of the animal. As for measuring the thickness of the body in the front and back, it was measured with a tape. The aforementioned measurement perpendicularly from the area where the neck is connected to the body towards the ground or from the end of the body towards the ground. The measurement is 1 cm included.

The lambs were sheared at the end of the experiment and by the method of automatic shearing and before the shearing a sample of wool with an area of 10 x 10 cm was taken about 40 - 60 gm from the center of the right mid side of the animal between the ends of the ribs 11 and 12 and at the level of the skin surface as it is the best area for taking The samples are according to what was reported by [13] and [14]. The sample was placed in small nylon bags with the animal number recorded, and after direct mowing, the wool was collected in large bags to weigh the raw fleece with an electronic scale. Each sample was taken from the above raw wool samples and weighed with a sensitive scale, then washed with warm water (55 °C) containing a non-ionic detergent (carpet cleaner) for 5 minutes to remove dust and dirt with stirring and squeezing, then washed with normal water to remove the detergent trace. The samples were left for 24 hours. To dry, then weigh the sample after that to calculate the weight of the clean sample and then estimate the percentage of clean wool and the weight of the clean fleece according to the following equations:

\[
\text{Clean sample weight} = \frac{\text{Clean wool} \times 100}{\text{Raw sample weight}}
\]

The length of a wool strand was measured in centimeters for 3 strands/ sample using a standard ruler without pulling from the base of the strand to the center of the pyramid forming the crest [15]. The length of the fiber was measured manually and using a ruler also for 5 fibrils randomly belonging to several strands of the sample after fixing its ends with special holders to be tight and straight as possible to adjust its true length. The number of folds was measured manually using a graph paper divided into square centimeters, and the fiber was placed on the paper to know the number of folds per centimeter.

The data were analyzed statistically by using the Complete Random Design (CRD) within the statistical program SAS [16].

Mathematical model of the factor affecting the studied traits:

\[
Y_{ij} = \mu + T_i + e_{ij}
\]

As:

- \(Y_{ij}\) = the studied characteristic of observation \(j\) and the transaction \(i\).
- \(\mu\) = the general mean of the studied trait.
- \(T_i\) = treatment effect (oil).
- \(e_{ij}\) = random error that is assumed to be distributed randomly and naturally with a mean equal to zero and variance of \(\sigma^2\).
3. Results and discussion

3.1. Body weight

Table 1, we can notice that there was no significant effect between the studied treatments in the initial weight, weight after one month, weight after two months and final weight. The results of our study are consistent with the study of [17] in their study on barkey ewes in Egypt, as they did not record a significant difference in the weight of pregnant ewes when using thyme, clove and anise oils. These results agreed with [18] when using sheep essential oils, as they found no improvement in production performance. The results of our study were also agreement with [19] who did not record significant differences in body weight when giving essential oils to male and female Karya lambs, as well as with the results of [20] in their experiment on milk cows when using a mixture of essential oils.

Table 1. Weights of lambs during the experiment period (mean ± standard error).

| Trait    | Initial weight | P1 (30 day) | P2 (60 day) | P3 (90 day) |
|----------|----------------|-------------|-------------|-------------|
| T1 Control | 30.60±1.30     | 40.78±1.44  | 45.56±1.46  | 49.76±0.92  |
| T2 Laurel oil | 30.60±1.63     | 38.12±1.22  | 42.98±2.20  | 46.02±3.19  |
| T3 Clove oil | 31.52±1.30     | 40.44±0.87  | 45.06±1.78  | 52.0±0.74   |
| T4 Sage oil  | 30.40±2.23     | 39.94±2.10  | 44.46±3.24  | 48.42±4.04  |

3.2. The condition and body dimensions of the lambs

From Table 2 there was a significant effect of the three experimental treatments on the control treatment in the characteristic of body width at the front (86.80, 84.60, 84.40, and 80.60) cm respectively and the chest circumference (22.0, 22.80, 22.0 and 20.80) cm respectively, while the first treatment was superior. And the third was on the control treatment in the characteristic of body width at the rear (23.40, 23.80, and 22.60) cm, respectively. All the studied treatments also significantly outperformed the control treatment in the characteristic of the body condition score (3.50, 4.20, 4.10, and 3.40) cm respectively. The treatments did not differ significantly from each other in the characteristic of body height at the front and at the back, abdomen circumference, body length, and body mass index. These results opposed to what was reported by [20, 21] when adding essential oils to their experiment on dairy cows.

Table 2. Measurements of body dimensions and body condition score (BCS) one month after the start experiment (mean ± standard error).

| Trait     | Body mass index (cm) | BCS  | Body length (cm) | Body width at the rear (cm) | Body width at front (cm) | Abdominal circumference (cm) | Chest circumference (cm) | Body height at the rear (cm) | Body height at the front (cm) |
|-----------|----------------------|------|------------------|----------------------------|--------------------------|-----------------------------|---------------------------|-------------------------------|--------------------------------|
| T1 Control    | 87.45±3.40          | c3.40| 69.0±2.38        | ab22.60±0.40              | b20.80±0.37             | 97.80±1.59                 | b80.60±0.40               | 57.20±0.73                   | 57.60±0.92                  |
| T2 Laurel oil | 73.20±0.41          | bc3.50| 73.80±2.26       | a23.40±0.40              | a22.0±0.54              | 96.20±2.31                 | a86.80±1.39               | 59.0±1.44                    | 60.40±0.97                  |
| T3 Clove oil  | 72.62±4.76          | a4.20| 75.0±1.78        | b21.80±0.20              | a22.0±0.37             | 95.40±1.16                 | a84.60±1.72               | 61.40±1.93                   | 60.80±0.86                  |
| T4 Sage oil   | 78.49±4.48          | ab4.10| 71.40±1.28       | a23.80±0.48              | a22.0±0.00             | 99.20±1.65                 | a84.40±0.40               | 59.60±1.02                   | 60.40±0.60                  |

- Different letters mean significant differences (p≤0.05)
From Table 3, it is noted that the third treatment was superior to the control treatment, while the first and second treatment did not differ significantly from the control treatment in the body height at the front (65.20, 64.0, 61.40, 60.60 cm) respectively, while the third treatment was significantly superior to the second and control treatment. In terms of body height at the rear (66.60, 63.80, 62.20, 62), it also outperformed the second treatment only in the abdominal circumference. The third treatment did not differ significantly from the first treatment in the two characteristics of body height at the rear and abdomen circumference, and the characteristics of chest circumference and body width were not recorded at the front and rear, body condition score and body mass index, any significant difference between the studied parameters. This result is in agreement with the findings of [20] in their experiment on dairy cows, while our findings differed with what [21] found, who found a decrease in body status score when adding essential oils to their experiment on dairy cows.

Table 3. Measurements of body dimensions and body condition score (BCS) at the end of the experiment (mean ± standard error).

| Trait   | Body mass index (cm) | BCS | Body length (cm) | Body width at the front (cm) | Abdominal circumference (cm) | Chest circumference (cm) | Body height at the rear (cm) | Body width at the rear (cm) |
|---------|----------------------|-----|------------------|-------------------------------|-------------------------------|--------------------------|-----------------------------|-----------------------------|
|         |                      |     |                  |                               |                               |                          |                             |                             |
| T1 Control | 92.59 ±0.91          | **a** | 70.60 ±1.88      | 26.60 ±1.12                  | 24.0 ±1.30                   | 104.60 ±2.29             | 92.0 ±2.34                  | 62.80 ±0.66                 |
| T2 Laurel oil | 76.935 ±0.90       | **b** | 75.0 ±1.70       | 26.20 ±1.07                  | 24.60 ±0.92                  | 106.20 ±1.35             | 96.20 ±2.22                 | 63.80 ±0.86                 |
| T3 Clove oil | 73.242 ±0.40        | **ab** | 78.40 ±1.02      | 25.80 ±1.57                  | 25.20 ±1.28                  | 103.40 ±2.89             | 93.80 ±2.33                 | 62.20 ±1.77                 |
| T4 Sage oil | 81.128 ±0.40        | **ab** | 74.60 ±1.72      | 27.80 ±0.48                  | 26.40 ±0.24                  | 110.40 ±1.20             | 96.0 ±2.14                  | 66.60 ±1.12                 |

- Different letters mean significant differences (p≤0.05)

Table 4 indicates the existence of significant correlations between body height at the front, body height at the rear, chest and abdomen circumference, and degree of body condition, as well as between body height at the rear, abdominal circumference, and body condition degree. As for the correlation of the chest circumference with the circumference of the abdomen, the width of the body at the front, and the degree of the condition of the body, it was significant, as well as the results recorded for the simple correlation coefficient a strong correlation between the circumference of the abdomen and the width of the body at the front and at the back and the primary weight, as well as the width of the body at the front with the width of the body at the rear and the degree of body condition Also, the correlation of body width at the stern with the degree of body condition, was highly significant at the end of the experiment. The body mass index was highly correlated with body weight with the weights of lambs in the experiment, as was the case with the weights of lambs among them.

Table 5 shows that there was a significant effect of weight regression on body height at the front during the duration of the experiment. It was also observed that there was a significant effect of weight regression on body height and body mass index. Whereas, the weight decline on the rest of the body dimensions did not affect the duration of the experiment.

In Table 6, we note a significant superiority of the control treatment over the laurel oil treatment. The differences were not significant between the three treatments between them in the characteristics of wool. As for the length of the fiber, the treatment in which sage oil was used surpassed the control treatment significantly (16.80 and 12.0) cm, respectively. While the differences were not significant effect between the parameters and for all characteristics. This result was in agreement with what [22] found, who observed no effect of canola oil and flaxseed oil on wool quality properties.
Table 4. Simple correlation coefficient between body dimensions, weights, and body condition score.

| Regression traits | Weight after 1 month on body dimension (kg/cm) | Significant | Final Weight regression on body dimension (kg/cm) | Significant |
|-------------------|-----------------------------------------------|-------------|-----------------------------------------------|-------------|
| Body height at the front (cm) | 0.061 | * | 0.258 | * |
| Body height at the rear (cm) | 0.076 | N.S | 0.313 | * |
| Chest circumference (cm) | 0.017 | N.S | 0.012 | N.S |
| Abdominal circumference (cm) | 0.009 | N.S | 0.058 | N.S |
| Body width at front (cm) | 0.567 | N.S | 0.189 | N.S |
| Body width at the rear (cm) | 0.090 | N.S | 0.279 | N.S |
| Body length (cm) | 1.117 | ** | 1.171 | ** |
| BCS | 0.865 | N.S | 0.019 | N.S |
| Body mass index (cm) | 0.492 | ** | 0.551 | ** |

* mean significant differences (p≤0.05), ** mean significant differences (p≤0.01)
Table 6. The effect of experiment treatments s on the wool traits (mean ± standard error).

| Trait                  | Crims/cm | Fiber length (cm) | Tuft length (cm) | clean fleece percentage (%) | clean fleece weight (kg) | Crude fleece weight (kg) |
|------------------------|----------|-------------------|------------------|-----------------------------|--------------------------|--------------------------|
| Control                | 0.24±    | 0.63±             | 0.48±            | 1.59±                       | 0.14±                    | 0.23±                    |
| T1                     | 1.80     | 12.0±             | 9.80             | 73.20 a                     | 1.05                     | 1.45                     |
| Laurel oil             | 1.90     | 14.60±            | 12.0             | 61.80 b                     | 1.05                     | 1.73                     |
| T2                     | 0.18±    | 1.24±             | 1.0±             | 3.62±                       | 0.03±                    | 0.12±                    |
| Clove oil              | 1.60     | 14.40±            | 11.80            | 67.20ab                     | 1.19                     | 1.75                     |
| T3                     | 0.17±    | 1.07±             | 0.73±            | 1.82±                       | 0.09±                    | 0.11±                    |
| Sage oil               | 1.90     | 16.80±            | 11.0             | 63.60ab                     | 1.10                     | 1.73                     |
| T4                     | 0.26±    | 0.96±             | 1.04±            | 4.50±                       | 0.10±                    | 0.09±                    |

- Different letters mean significant differences (p≤0.05)

References

[1] Fandino, I., Calsamiglia, S. Ferret, A. and Blanch, M.(2008). Anise and capsicum as alternatives to monensin to modify rumen fermentation in beef heifers fed a high concentrate diet. Animal Feed Science Technology. 145, 409-417.

[2] Vakili, A.R., Khorrami, B., Danesh Mesgaran, M. and Parand, E. (2013). The effects of thyme and cinnamon essential oil on performance, rumen fermentation and blood metabolites in Holstein calves consuming high concentrate diet. Asian Australs Journal of Animal Science. 26, 935-944.

[3] Hristov, A.N., McAllister, T.A., VanHerk, F.H, Cheng, K.J., Newbold, C.J., Cheeke, P.R. (1999). Effect of Yucca Schidigera on ruminal fermentation and nutrient digestion in heifers. Journal of Animal Science, 77, 2554-2563.

[4] Morsy AS, Eissa MM, Anwer MM, Ghabashy H, Sallam SMA, Soltan YA, Saber AM, El-Wakeel EA, Sadik WM . (2018). Colostral immunoglobulin concentration and milk production of ewes fed salt tolerant forages as alternatives to berseem hay. Livestock Science 210, 125–128.

[5] Soltan YA, Hashem NM, Morsy AS, El-Azrak KM, El-Din AN, Sallam SM . (2018). Comparative effects of Moringa oleifera root bark and monensin supplementations on ruminal fermentation, nutrient digestibility and growth performance of growing lambs. Animal of Feed Science Technology. 235 ,189–201.

[6] Merkhan1, K. Y., K. N. Mustafa R. H. Isa M. S. Q. Barwary E. T., Buti C. A. Yatem. (2019). Evaluation of medicinal plants (quercusinfectoria and astragalus eriocephalas) as feed additives in Awassi ewe’s ration. Iraqi Journal of Agricultural Sciences:50(2) , 515-525.

[7] Barwary, M. S. Q., K. Y. Merkhan1., E. T. S. Buti, R. H. Isa, K. N. Mustafa C. A. Yatem. (2019). Evaluation of medicinal plants (Astragalus eriocephalas and quercus infectoria) as feed additives in Awassi ewe’s ration. Iraqi Journal of Agricultural Sciences:50(2) , 526- 533.

[8] Busquet M, Calsamiglia S, Ferret A, Kamel C. (2006). Plant extracts affect in vitro rumen microbial fermentation. Journal of Dairy Science, 89(2), 761–771.

[9] Jahani-Azizabadi H, Danesh Mesgaran M, Vakili AR, Rezayazdi K, Hashemi M. (2011). Effect of various semi-arid native medicinal plant essential oils on ruminal fermentation, nutrient digestibility and growth performance of growing lambs. Animal of Feed Science Technology. 235 ,189–201.

[10] Spanghero, M., Zanfi, C., Fabbro, E., Scicutella, N., Camellini, C. (2007). Effect of milk replacers added with microencapsulated organic acids or essential oils on the performance of weaning calves. Italian Journal Animal Science., 6 , 366.

[11] Youssef, M.M., Abo-Donia, F.M., Affify, A.A., Osman, A.O., (2009). Effect of added Punica granatum peel and Nigella sativa seeds on immunology and performance of suckling buffalo calves. In: Proceedings of the Middle East & North Africa (MENA) Region Animal Wealth Research Conference, Future of Animal Wealth, Cairo International Convention Center, Massive Conferences and Trade Fair,41, 12 , 293-305.

[12] Oralpaydina, H.B. (2014). The effects of organo oil usage in milk on holstein calf growth performance. Master thesis, Mustafa Kemal University, Graduate School of Natural and Applied Sciences Department of Animal Science, Hatay, Turkey.

[13] Animal Science, Hatay, Turkey.

[14] Gifford J.D.R.(1989). A not on the variation in fleece characteristics over the body of Australians Angora bucks. British Society Animal Production.48 , 245-247.

[15] Mohammed, M.A., Salman, S.R., (2017), Structural and surface roughness effects on sensing properties of ZnO doping with Al thin films deposited by spray pyrolysis technique. Journal of Engineering and Applied Sciences, 12 (Specialissue6), pp. 7912-7918.

[16] VonBorgen W.1963.Hand book 3thed. VI. John Willy &S&S Inc. New York .London.

[17] SAS. (2009). SAS Users Guide: Statistics (Vesion-sed). SAS Inst. Inc. Cary. NC. USA. Ver. 9.1.

[18] El-Essawy1, A., M., A., R. Abdou1, and M. H. EL- Gendy. Impact of Anise, Clove, and Thyme essential oils as feed supplements on the productive performance and digestion of Barki ewes.(2019). Australian Journal of Basic and Applied Sciences, 13(6) ,1-13.
[19] Ribeiro A.D.B., M.V.C. Ferraz Junior2, D.M. Polizei1,3, A.A. Misura1, L.G.M. Gobato1, J.P.R. Barroso1, I. Susin3, A.V. Pires1,3 Thyme essential oil for sheep: effect on rumen fermentation, nutrient digestibility, nitrogen metabolism, and growth Arq. Bras. Med. Vet. Zootec., 71, 6, 2065-2074, 2019
[20] Mohammed, M.A., Salman, S.R., Abdulridha, W.M., (2020), Structural, optical, electrical and gas sensor properties of zro2 thin films prepared by sol-gel technique, NeuroQuantology, 18(3), pp. 22–27.
[21] Kung, L.; Williams, P.; Schmidt, R.J.; Hu, W. (2008). A blend of essential plant oils used as an additive to alter silage fermentation or used as a feed additive for lactating dairy cows. Journal of Dairy Science. 91, 4793–4800.
[22] Santos, M.B.; Robinson, P.H.; Williams, P.; Losa, R. (2010). Effects of addition of an essential oil complex to the diet of lactating dairy cows on whole tract digestion of nutrients and productive performance. Anim. Feed Sci. Technol. 157, 64–71.