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Effect of Supplementing Local and Imported Probiotics on Some Carcass Traits of Awassi Lambs

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Abstract

This study was conducted at the Agricultural Research and Experiment Station, College of Agriculture, University of Muthanna, located in the Um Al-Akaf area, Southwest of Samawah, Iraq, from 26/10/2024 to 29/12/2024, to evaluate the effects of supplementing two levels of Iraqi and imported probiotics on carcass characteristics of Awassi lambs. Twenty Awassi male lambs (5–6 months old and 28.20 ± 0.58 kg BW) were fed a concentrate diet at 3% of body weight along with free access to roughage (alfalfa straw). The experimental treatments included: T1 (control) – concentrate diet without probiotics + roughage; T2 – concentrate diet with 8 g of Iraqi probiotic / ton of feed + roughage; T3 – concentrate diet with 10 g of Iraqi probiotic/ ton of feed + roughage; T4 – concentrate diet with 8 g of imported probiotic/ ton of feed + roughage; and T5 – concentrate diet with 10 g of imported probiotic /ton of feed + roughage. The results indicated a significant increase ($P \leq 0.01$) in hot carcass weight, cold carcass weight, and dressing percentage in lambs of T2, T4, and T5 compared to T3 and the control. Moreover, the relative weights of leg and shoulder cuts were significantly higher in lambs of T2, T4, and T5 compared to the control, while no significant differences were observed in rib and loin cuts.

Keywords: Awassi lambs, Probiotics, carcass characteristics

Introduction

Global meat production reached 263 million tons in 2018 and is expected to rise to 445 million tons by 2050, primarily due to the increasing demand for animal-derived proteins[1]. The demand for meat from small ruminants, such as sheep lambs and goat kids, has increased considerably due to their higher nutritional value compared to other ruminants [2].

Recently, considerable attention has been directed toward identifying alternatives to antibiotics that can promote animal growth while minimizing potential health risks for consumers. Among these alternatives, probiotics have received increasing interest [3,4, 5]. Probiotics can be define as selected groups of beneficial microorganisms, play an important role in improving the ruminal microbial ecosystem, with enhance ruminal fermentation which improves productivity of sheep lambs [6,7].Moreover, the inclusion of probiotics in diets has been reported to improve carcass weight, and meat quality in goat kids [8] and sheep lambs [9]. Similarly, enhancements in carcass traits of lambs have also been documented with Iraqi probiotic [10 , 11, 12] .However, other studies have indicated that dietary yeast supplementation may have no significant effect on carcass characteristics [13]. Nevertheless, the reported responses to probiotic supplementation have been inconsistent across studies [6, 14].

Therefore, the present study was designed to evaluate the effect of supplementing different levels of the locally produced Iraqi probiotic and the imported probiotic to the diet on certain carcass characteristics of Awassi lambs.

Material and methods

This study was conducted at the Agricultural Research and Experiment Station, College of Agriculture, University of Muthanna, located in the Um Al-Akaf area, Southwest of Samawah, Iraq, from 26/10/2024 to 29/12/2024, to determine the effect of supplementing two levels of local (Iraqi) probiotic and two levels of imported probiotic on some carcass characteristics of Awassi lambs. Twenty Awassi male lambs were used in this study and randomly divided into five groups, with four lambs in each group. The treatment groups were as follows: T1 (Control): Lambs were fed a concentrate diet without any probiotic supplementation. T2 and T3: Lambs were supplemented with 8 and 10 kg/ton of feed, respectively, of local (Iraqi) probiotic

containing *Bacillus subtilis*, *Lactobacillus acidophilus*, *Lactobacilli*, and *Saccharomyces cerevisiae.*While*,* T4 and T5: Lambs were supplemented with 8 and 10 kg/ton of feed, respectively, of imported probiotic containing *Bacillus subtili*s and *Lactobacillus acidophilus*. All lambs were fed a concentrate diet at 3% of their live body weight, twice daily with alfalfa straw provided *ad libitum* as a roughage source. The feeding trial lasted for 64 days. The ingredient and chemical composition of concentrate diet and roughage diet are presented in Table 1.

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Table 1. Ingredients and chemical composition of the concentrate diet and alfalfa straw (on DM% basis)

Ingredients	Concentrate Diet (%)	Alfalfa Straw (%)
Barley grain	43	-
Wheat bran	38	-
Yellow corn	10	-
Soybean meal	7	-
Limestone	0.5	-
Salt	0.5	-
Premix	1	-
Alfalfa hay	-	35
Wheat straw	-	65
Chemical composition		
Dry Matter (DM)	90.12	89.74
Organic Matter (DM)	93.04	93.19
Crude Protein (CP)	15.22	6.27
Ether Extract (EE)	3.10	2.30
Crude Fiber (CF)	7.46	38.36
Ash	5.57	6.81
Nitrogen-Free Extract (NFE)	67.26	46.06

Two lambs from each treatment group were slaughtered at the end of the experimental period, after being fasted for 12 hours with free access to water only. Slaughtering was performed according to the standard Islamic method. Hot carcass weight was recorded approximately 30 min. after slaughter using an electronic scale. Cold carcass weight was determined after chilling the carcasses at 2 °C for 24 h. The dressing percentage was calculated as the ratio of hot carcass weight to the live body weight before slaughter. After chilling, each carcass was split into two equal halves using an electric saw. The left half was divided into eight cuts: four major cuts (leg, shoulder, ribs, and loin) and four minor cuts (breast, neck, flank, and fore shank). Fat-tail (tail fat) weight was also recorded

Data were statistically analyzed using a Completely Randomized Design (CRD) to study the effect of the treatments. Differences between means were determined using Duncan's multiple range test [15], and all analyses were performed using the SPSS software [16].

Results and Discussion

Hot carcass weight, cold carcass weight, and dressing percentage

Table (2) illustrated a significant increase ($P \leq 0.01$) in hot carcass weight for Awassi lambs in T2 (8 kg local probiotic/ton of feed), T4 (8 kg imported probiotic/ton of feed), and T5 (10 kg imported probiotic/ton of feed), with values of 16.10, 17.90, and 16.23 kg, respectively, compared to lambs in T3 (10 kg local probiotic/ton of feed) and the control group (without probiotic supplementation), which recorded 12.93 and 10.90 kg, respectively. No significant differences were found among T2, T4, and T5. This improvement may be attributed to the positive effect of probiotic supplementation (both local and imported) on hot carcass weight, compared with control. These findings agree with those of several researchers who reported similar improvements when using Iraqi probiotics in lamb diets [10]. However, the present results contradict some studies that found no significant differences in hot carcass weight between probiotic-supplemented and control lambs fed diets containing Iraqi probiotics or yeast-based probiotics (Al-Issawi, 2008; [14, 17, 18]. Similarly, a significant increase ($P \leq 0.01$) in cold carcass weight was observed in lambs of T2 (15.53 kg), T4 (17.22 kg), and T5 (15.98 kg), compared to T3 (12.64 kg) and the control (10.51 kg). No significant differences were detected among T2, T4, and T5. The improvement in cold carcass weight can be attributed to enhanced feed digestibility, increased nutrient absorption, and improved health status of lambs, which positively influenced growth performance. These results are consistent with those reported by [12], who investigated the effect of probiotics on Awassi lamb carcasses, but differ from those [19] and [20] , who found no significant differences in cold carcass weight of lambs and goat kids fed probiotic-supplemented diets compared to unsupplemented control.

Table (2). Effect of adding local and imported probiotics to the diet on hot and cold carcass weight and dressing percentage of Awassi lambs (Mean ± SE)

Treatments	T1 Control	T2 8 kg Iraqi Probiotic	T3 10 kg Iraqi Probiotic	T4 8 kg Imported Probiotic	T5 10 kg Imported Probiotic	Sig.
Hot carcass weight (kg)	10.90b±0.40	16.10a±1.45	12.93b±0.87	17.90a±0.70	16.23a±0.68	**
Cold carcass weight (kg)	10.51b±0.41	15.53 ±1.38	12.64b±0.14	17.22a±0.67	15.98a±0.73	**
Dressing Percentage (%)	26.91c±0.01	41.83a±0.04	32.52bc±0.02	41.55a±4.95	38.41ab±0.01	*

Means with different superscripts within a row differ significantly (P≤0.05); NS: Not Significant, *: (P≤0.05), **: (P≤0.01).T1: Control (0 kg/ton), T2: 8 kg Local Probiotic/ton feed, T3: 10 kg Local Probiotic/ton feed, T4: 8 kg Imported Probiotic/ton feed, T5: 10 kg Imported Probiotic/ton feed

Regarding dressing percentage based on live weight, the results showed a significant improvement (P ≤ 0.05) in lambs of T2 (41.83%), T4 (41.55%), and T5 (38.41%) compared to the control group (T1; 26.91%). No significant differences were observed among T2, T4, and T5, while lambs in T3 also showed a significant increase compared to the control. These findings are in agreement with those reported by [12], who demonstrated that feeding Awassi lambs Iraqi probiotics improved dressing percentage. However, the present results disagree with [21], who found no significant effect on dressing percentage in lambs supplemented with bacterial probiotics (*Lactobacillus gallinarum*) or yeast compared to those fed probiotic-free diets. In addition, [14] reported no significant effects on hot and cold carcass weights or dressing percentage in lambs when diets were supplemented with yeast.

Relative weight of major carcass cuts

Table (3) showed a significant increase (P ≤ 0.05) in the relative weight of the shoulder in all probiotic-supplemented groups, with lambs in T2, T4 and T5 showing the highest values of 18.86%, 18.43%, and 16.77%, respectively, compared to T3 (15.13%) and the control group, which recorded the lowest value (12.48%). Similarly, the relative weight of the leg increased significantly (P ≤ 0.05) in all probiotic treatments, with the highest

values observed in T2 (31.88%), T5 (30.50%), and
T4 (30.48%), while T3 (28.29%) also showed a significant improvement compared to the control group, which recorded the lowest percentage (29.73%).On the other hand, statistical analysis indicated no significant differences among treatments and the control group in the relative weights of ribs and loin. In addition, the results showed a significant decrease ($P \leq 0.01$) in tail fat weight (fat-tail) in all probiotic-supplemented groups, with lambs in T5 (7.52%), T4 (7.55%), and T3 (7.62%) having significantly lower values compared to the control group (8.33%).

Table (3). Effect of supplementing local and imported probiotics in the diet on the relative weight of major carcass cuts and tail fat in Awassi lambs (Mean ± SE)

Treatments	T1 Control	T2 8 kg Iraqi Probiotic	T3 10 kg Iraqi Probiotic	T4 8 kg Imported Probiotic	T5 10 kg Imported Probiotic	Sig.
Shoulder(%)	12.48^{c}±0.03	18.86^{a}±0.03	15.13^{b}±0.07	18.43^{a}±0.01	16.77^{ab}±0.01	*
Leg (%)	29.73^{c}±0.03	31.88^{a}±0.08	28.29^{b}±0.12	30.48^{ab}±0.05	30.50^{a}±0.41	*
Ribs (%)	17.36±0.03	17.39±0.08	16.93±0.02	17.85±0.03	17.99±0.04	NS
Loin (%)	5.95±0.01	5.97±0.05	6.05±0.05	5.32±0.01	5.32±0.07	NS
Fat-tail(%)	8.33^{a}±0.09	8.06^{b}±0.07	7.62^{c}±0.02	7.55^{c}±0.01	7.52^{c}±0.03	**

Means with different superscripts within a row differ significantly (P≤0.05); NS: Not Significant, *: (P≤0.05), **: (P≤0.01).T1: Control (0 kg/ton), T2: 8 kg Local Probiotic/ton feed, T3: 10 kg Local Probiotic/ton feed, T4: 8 kg Imported Probiotic/ton feed, T5: 10 kg Imported Probiotic/ton feed.

The findings are consistent with previous studies that used Iraqi probiotics in Awassi lamb diets [10], which reported significant increases in the relative weights of leg and shoulder cuts in lambs supplemented with probiotics compared to non-supplemented lambs. These results are also in agreement with those of [11] who observed similar effects when using probiotics in the diets of Arabi lambs. Moreover, [11] reported a significant reduction in fat-tail weight in Arabi lambs supplemented with 3 or 5 kg of Iraqi probiotics per ton of concentrate, attributing this reduction to the shift in fat deposition sites caused by probiotic supplementation.

Relative weight of secondary carcass cuts

Table (4) shows the effect of supplementing local and imported probiotics in the diet on the relative weights of the secondary carcass cuts (shank, brisket, neck, and flank). The results indicated no significant effects of probiotic supplementation (Iraq or imported) on the relative weights of the shank, neck, and flank in all treated groups. However, a significant improvement ($P \leq 0.05$) was observed in the relative weight of the brisket in lambs supplemented with Iraqi probiotics, specifically in T2 (5.97%) and T3 (6.43%), compared to the control (4.99%). The lowest brisket weights were recorded in lambs fed imported probiotics compared to the control. This variation may be attributed to differences in probiotic strains used in the present study. These findings agree with those of [11] who reported improvements in brisket weight when lamb diets were supplemented with probiotics.

The observed increase in the relative weights of major carcass cuts and reduction in secondary cuts in probiotic-supplemented groups compared to the control may be attributed to the positive effects of both local and imported probiotics in improving nutrient digestibility and feed utilization. This enhancement likely resulted in better growth performance due to improved animal health and stabilization of rumen conditions, promoting the growth of lactic acid-utilizing microorganisms and enhancing cellulolytic bacterial activity. Improved digestibility leads to higher concentrations of volatile fatty acids in the rumen, which serve as the primary energy source for ruminants, thereby contributing to greater weight gain and carcass weight [22]. The findings of the present study also support earlier reports indicating that probiotic supplementation improved carcass cut proportions while reducing fat deposition [10, 11]. This effect has been linked to increased production of propionic acid in the rumen, which is converted into glucose, as well as enhanced microbial protein synthesis at the expense of fat deposition [11]. Furthermore, yeast supplementation supports protozoal activity and promotes lactic acid utilization, thereby improving nutrient efficiency.

Table (4): Effect of adding local and imported probiotics to the diet on the relative weight of secondary carcass cuts of Awassi lambs (Mean ± SE)

Treatments	T1 Control	T2 8 kg Iraqi Probiotic	T3 10 kg Iraqi Probiotic	T4 8 kg Imported Probiotic	T5 10 kg Imported Probiotic	Sig.
Shank (%)	9.99±0.01	9.83±0.07	8.80±0.01	8.42±0.04	9.23±0.05	NS
Brisket(%)	4.99^{c}±0.04	5.97^{b}±0.05	6.43^{a}±0.03	4.21^{d}±0.02	3.91^{c}±0.02	**
Neck (%)	7.85±0.07	7.56±0.14	7.22±0.02	6.10±0.06	6.58±0.02	NS
Loin (%)	3.97±0.01	4.52±0.08	4.55±0.15	5.67±0.11	5.63±0.06	NS

Means with different superscripts within a row differ significantly (P≤0.05); **: (P≤0.01), NS: Not Significant. T1: Control (0 kg/ton), T2: 8 kg Iraqi Probiotic/ton feed, T3: 10 kg Iraqi Probiotic/ton feed, T4: 8 kg Imported Probiotic/ton feed, T5: 10 kg Imported Probiotic/ton feed.

Conclusion

The supplementation of local and imported probiotics in Awassi lamb diets improved carcass performance by increasing hot and cold carcass weights, dressing percentage, and the relative weights of major cuts such as the leg and shoulder, while reducing fat-tail deposition. Iraqi probiotics also enhanced brisket weight compared to the control. These improvements are likely due to enhanced growth performance of Awassi lambs, As a result, a significant improvement was achieved in the weights of the carcass cuts, providing a favorable economic indicator.

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