

Growing Farafra and Chios Lambs Fed Rations Containing Various Hay Levels

2- Carcass Traits

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Abstract

The present study was carried out at Mallawi Animal Production Research Station, belonging to Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture in cooperation with Animal and poultry Production Department, Faculty of Agriculture, Assiut University to evaluate carcass traits after early fattening experimental period (105 days). Lambs fed rations containing various hay levels (0 %, 6 % and 15 %). At the end of the experiment, eighteen Farafra and Chios lambs were slaughtered to study carcass yield and traits. Farafra lambs recorded higher hot carcass weights (21.61) than Chios lambs (17.79kg). The dressing percentage based on slaughter weight (A) was significantly ($P < 0.05$) higher in Farafra lambs than in Chios lambs (50.11 vs. 47.89%). The prime cuts percentage in Chios lambs were highly significantly ($P < 0.01$) better than in Farafra lambs (79.11 vs. 75.89%). Farafra lambs had higher carcass cuts

weights (shoulder, legs, loin, rack, neck, brisket, flank and tail) than Chios lambs as well as offals. The dressing percentage estimated relative to empty body weight (B) did not differ significantly due to hay level in the ration (55.67 in 15 % vs. 55.33 % in 0% hay). The high level of hay in the ration (15%) recorded higher offal weights than the low level (6%) or full concentrate without hay. Farafra lambs had higher sample meat (287 g) of the 9, 10 and 11th ribs cut and meat in carcass (11.73 kg) than Chios lambs (217g) and (9.30 kg), respectively. The differences due to breed genotype were highly significant ($P < 0.01$). Also, eye muscle area (longissimus dorsi) was higher in Farafra than Chios lambs (11.91 vs. 11.42 cm²), and the differences were highly significant ($P < 0.01$). Weight of 9, 10 and 11th ribs cut of the group 15% hay carcasses was higher by 7.73 and 8.66% compared to those of group 6% hay or group 0% hay, respectively. But, differences due to hay levels in the ration were not significant.

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Introduction

In Egypt, fattening process depends on supplementary feeding rather than grazing. This is due to that production of either grazing or cultivated areas permissible to animals, is not enough to cover even the maintenance requirements of livestock population which renders possibility to increase livestock population to a rather unfeasible process. Moreover, towards better utilization of concentrates in feeding sheep and economic optimization of production per animal unit (Shehata, 1997). Furthermore, lambs were also fed grain supplements beside hay, in order to reduce the risk of acidosis (Ponnampalam *et al.*, 2004). Abd El Ati *et al.*, (2008) found that Farafra ram lambs exhibited better performance on early fattening than Chios ram lambs into final weight, average daily gain and total gain through fattening period. When concentrates were used with alfalfa 15 % level for early fattening did improve growth performance (body weight, average daily gain and total gain). Also, when hay level was increased to 15% with concentration, it improved the feed conversion efficiency (kg DM consumed/kg gain) and reduce the feed cost / kilogram by about 20.2%. Therefore, the main objective of the present work was to study the effect of substitution of barley grains in ration with hay at different levels on carcass traits of early fattening Farafra and Chios lambs.

Materials and Methods

The present study was carried out at Mallawi Animal Production Research Station, belonging to Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture. Thirty growing Chios and Farafra ram lambs (12 and 18 lambs, respectively), with 3 – 3.5 months of age were randomly divided into three equal groups. Barley grains were substituted with 0 %, 6 % and 15 % hay. The rations were offered *ad libitum*, using specific feeders. At the end of the experimental period 105 days, 6 animals from each group (3 Farafra and 3 Chios) were chosen randomly and slaughtered after fasting for 12 hours, to study the carcass yield and traits. After slaughter, weights of hot carcass, pelt, head, 4 feet, full and empty digestive tract, spleen, heart, testes, kidneys and internal fat were recorded, these measurements and classifications of carcass were carried out according to Abou-Ammou (1992). The carcasses were disjoined into the following whole sale cuts: legs (thigh), lion, rack, shoulders, neck, flank, brisket and tail. The first four cuts were considered as prime cuts, while the latter four were considered as secondary cuts. Weight of each cut was recorded. The 9, 10 and 11th ribs cut (Best rib cut) of right side was separated and chilled for 24 hours at 5°C, then physically dissected to their components : bone, separable fat and lean meat. Eye muscle area (*longissi-*

mus dorsi) was measured in squared centimeters using planimeter Model LI-3000, LICOR, U.S.A (Henderson *et al.*, 1966). Duplicate sub-samples of *Longissimus dorsi* were analyzed for moisture, crude protein ($N \times 6.25$), ether extract and ash of both feeds and meat, according to AOAC (1995).

Data were statistically analyzed using the General Linear Model (GLM) procedure, Least-Squares Means Method (LSM), (SAS, 1995), and Duncan's multiple range test (Duncan, 1955).

Results and Discussion:

Breed effect: Table (1) showed that Farafra lambs recorded the highest slaughter weight (43.11 kg), compared to Chios lambs (37.44 kg), although differences were not significant. The corresponding empty body weights values were 39.17 and 32.33 kg, and hot carcass weights were 21.61 and 17.97 kg. Breed differences were significant ($P < 0.05$). Ali (1994) found that carcass weight was highly significant ($P < 0.01$) heavier for Ossimi than Chios lambs (21.4 kg vs. 18.2 kg), although all lambs had nearly similar slaughter weight (44.1 and 43.5 kg for Ossimi and Chios lambs, respectively). El-Mahdy *et al.*, (2000) reported that hot carcass weight was significantly higher for Ossimi lambs (19.08) than crossbred one (18.84 kg).

Data in Table (1) showed that dressing percentage (A), relative to slaughter weight was significantly ($P < 0.05$) higher in Farafra lambs than in Chios

lambs (50.11 vs. 47.89%). However, the dressing percentage (B), relative to empty body weight was slightly higher but not significant for Chios (55.44%) than for Farafra lambs (55.11%). This difference may be due to the Chios lambs had higher gut content (5.118 kg) than Farafra ones (3.945 kg). The prime cuts (shoulder, leg, loin and rack) percentage were highly significant ($P < 0.01$) higher in Chios lambs than the Farafra lambs (79.11 vs. 75.89%). These percentages are higher than those obtained by Ali (1994) who recorded lower fasting dressing percentages (49.2% for Ossimi and 42.7% for Chios, as well as empty dressing percentages were 60.8% for Ossimi and 52.7% for Chios lambs). However, El-Mahdy *et al.*, (2000) found that dressing percentages (A) were 46.70 and 46.20% and dressing percentages (B) were 54.60 and 54.50% for Ossimi and $\frac{1}{2}$ Rahmani \times $\frac{1}{2}$ Ossimi crossbred lambs, respectively. Average percentages of total prime cuts were nearly similar in both Ossimi (72.10%) and crossbred carcasses (71.80%).

Table (1) showed that Farafra lambs had higher carcass cuts weights (shoulder, legs, loin, rack, neck, brisket, flank and tail) than Chios lambs, although differences were not significant except in tail and the brisket where differences were significant. On the other hand, Chios lambs had the highest shoulder (19.22%) and

legs percentages (32.86%), while Farafra lambs had the highest tail percentage (7.71). Breed differences were significant. Generally, all carcass cuts were affected significantly by breed groups. Ali (1994) found that the effect of breed group on fore and hind quarters percentages of the carcass was significant ($P < 0.01$). Chios lambs had significantly higher fore quarter percentage (54%) than Ossimi lambs (48.4%). Tail fat weight was heavier in Ossimi than in Chios breed (2.0 vs. 0.7 kg). El-Mahdy *et al.*, (2000) reported that the round, loin, rack and shoulder percentages of crossbred carcasses were 30.22, 7.79, 16.40 and 17.86%, respectively. While, neck, brisket, flank and tail percentages were 8.68, 4.55, 3.59 and 10.84%, respectively for Ossimi lambs. The average percentage of brisket cut of crossbred carcass was significantly ($P < 0.01$) higher than the corresponding cut in Ossimi carcasses.

The edible and unedible parts weights are shown in Table (2). Farafra lambs had the highest weight of liver, kidneys, testes, heart, lungs & trachea, internal fat, kidneys fat, tail fat and total offals but the differences due to breed effect were not significant except total offals differed significantly ($P < 0.05$), internal fat and tail fat differences were highly significant ($P < 0.01$). Breed differences may be attributed to that tail fat weight was heavier in Farafra lambs than in Chios lambs (1.70 vs. 0.71) and as a

percent of hot carcass weight (7.71 vs. 4.05%). However, the spleen weight as a percent of slaughter weight was significant ($P < 0.05$) higher in Chios lambs than Farafra lambs.

Farafra lambs had a significant ($P < 0.01$) higher pelt either as absolute weight or as a percent of slaughter weight than Chios lambs and vice versa head weight as a percent of slaughter weight and gut content weight was higher in Chios than in Farafra lambs (Table, 1). The kidneys weight was affected by breed group and the differences were significant ($P < 0.05$). In this respect, Abou-Ammou (1992) reported that Rahmani lambs had the higher pelt weight than crossbred (2 kg) and the differences due to breed group were significant. The gut full weight and gut empty weight did not differ between two breed groups. The internal fat and kidney fat weight differences between the breed groups were highly significant ($P < 0.01$). Rahmani lambs had significantly heavier tail weight than the crossbred lambs, and the differences between breed group were highly significant ($P < 0.01$), Abou-Ammou (1992). El-Mahdy *et al.* (2000) found that percentage of offals and internal organs of Ossimi lambs were higher than crossbred in pelt, head, legs, tests and internal fat, lower than crossbred in digestive tract empty, liver, heart, kidneys fat and nearly equal in percentages of kidneys, lungs & trachea and spleen. The differences between

percentages of heart, spleen and testes due to breeds were significant ($P < 0.05$ & $P < 0.01$).

Feeding system: Data in Table (1) showed that slaughter weights, empty body weights and hot carcass weights increased significantly as the level of hay in the ration increased, however, the differences due to the level of hay were not significant. The dressing percentage (A), as estimated relative to slaughter weight was better in full concentrate ration without hay than the other diets contained 6 % or 15 % hay, but the differences due to hay level were not significant. The dressing percentage (B), estimated relative to empty body weight was higher in ration contained 15% hay than in full concentrate ration without hay (55.67 vs. 55.33%), but the effect of hay level on dressing percentage (B) was not significant. These results may be attributed to the differences in hay levels were probably not sufficient to cause changes in carcass composition to occur. While, Preziuso *et al.*, (1999) reported that, when use of concentrate with maize oil without hay (diet 1) caused heavier carcasses and better dressing percentage (17.57 kg – 51.87%) than diet 2 (concentrate + barley flakes + hay) (16.17 kg – 49.54%) and diet 3 (concentrate + maize oil + hay), (15.34 kg – 49.24%). Differences due to feeding system were highly significant ($P \leq 0.001$). Fimbres *et al.*, (2002) studied the effect of forage level in the ration on pro-

ductive performance and carcass characteristics in lambs. They found that hot and cold carcass weights decreased as the level of hay in the ration increased ($P < 0.05$). Hay levels of 0, 10, 20 and 30% in the ration were associated with hot carcass weights of 21.5, 19.6, 19.2 and 18.5kg, respectively. Hot and chilled dressing percentages were not affected ($P > 0.05$) by the hay level in the ration. However, El-Bedawy *et al.*, (2004) found that hay level had no significant effect on carcass weight and dressing percentage. The carcass weights were 19.51 and 19.15 kg for rations contained 10% and 30% hay, respectively. The corresponding values for dressing percentages were 47.45 and 46.67%.

Table (1) showed that shoulder, leg, loin, rack and neck weights were increased as the level of hay in the ration increased, but the differences due to hay level were not significant. The prime cuts percentages were similar in lambs fed full concentrate without hay and lambs fed concentrate with 15% hay (78.00%), but they were lower (76.50%) in lambs fed concentrate with 6% hay. The carcass cuts as percentage of hot carcass weight differed insignificantly except for shoulder, loin and flank were significant ($P < 0.05$) with different hay levels. Preziuso *et al.*, (1999) fed concentrate with maize oil without hay (diet 1), diet 2 (concentrate + barley flakes + hay) and diet 3 (concentrate + maize oil + hay). They

found that lambs fed on diet 3 showed less proximal thoracic limb cuts than those on diet 1 and 2 ($P \leq 0.01$). However, they tended to give better percentages in steaks + brisket and lumber + abdominal region cuts, although this difference was not statistically significant.

The high level of hay ration (15%) increased offal weights than the low level one (6%) or full concentrate without hay, Table (2). Fat weights were 1.482, 1.766 and 1.594 kg for 0%, 6% and 15% hay, respectively. Level of hay in the rations did not affect significantly ($P > 0.05$) full, empty GIT weights and gastro intestinal content. However, full GIT weight and gastro intestinal content tended to increase as the level of hay in the ration was increased. Heavier full GIT weight of lambs fed ration containing hay could be attributed to the higher fiber content which has a greater capacity to retain water (Fimbres *et al.*, 2002). Also, El-Bedawy *et al.*, (2004) found that no significant differences in the percentage of total body fat weights to slaughter weight of lambs fed either low or high roughage rations.

The edible offals and non-edible parts as percentage of slaughter weight and the differences due to hay levels were significant ($P < 0.05$) with testes and pelt only. Edible offal as percent of slaughter weight was higher in group 3 (5.60%) than those in groups 1 (5.28%) and group 2 (5.31%). Also, full GIT as per-

cent of slaughter weight was higher in group 3 (18.89%) than group 1 and group 2 (17.87 & 17.81%, respectively). Group 1 had higher kidney fat (0.39%) as percent of hot carcass weight as compared with group 3 (0.35%). Testes as percent from slaughter weight increased as the level of hay in the ration increased (testes percent were 0.70, 0.90 and 1.00% for groups 1, 2 and 3, respectively). These results are in agreement with Fimbres *et al.*, (2002) who found that the weights of skin, liver, lungs and blood were not affected by the level of hay. Testes weights were 479 and 555 g for hay level of 0 and 30% in the ration, respectively. They added that full GIT weight tended to increase significantly ($P > 0.05$) with increasing hay in the ration. Full GIT weights were 6.6, 7.1, 7.4 and 7.9 kg for hay levels of 0, 10, 20 and 30% in the ration, respectively.

Physical and chemical composition of 9, 10 and 11th ribs cut

Physical composition

Breed effect: Weight of 9, 10 and 11th ribs cut of the Farafra lambs were higher by 25.3% compared to Chios lambs, but the differences due to breed were not significant (Table 3). Similar trend was observed for samples of meat and fat weights, samples of meat and fat percentages, boneless meat percentage, meat:bone ratio, coefficient of meat, eye muscle area, meat in carcass. Farafra lambs had higher sample meat (287 g) and meat in carcass (11.73 kg) than Chios

lambs (217g) and (9.30 kg) respectively. Breed differences were highly significant ($P < 0.01$). These results could be attributed to that Farafra lambs had higher slaughter weight, empty body weight and hot carcass weight than Chios lambs. On the other hand, Farafra lambs had insignificant lower sample bone weight (91g) sample bone percentage (17.12%) and bone in carcass (3.70 kg) than Chios lambs (94 g, 22.79% and 4.02 kg), respectively. Chios lambs had higher meat:fat ratio 2.43 than the Farafra lambs 2.02, while, the meat : bone ratio was significant ($P < 0.01$) lower in Chios lambs than in Farafra lambs (2.33 vs. 3.21). Coefficient of meat was higher in Farafra than Chios lambs (4.90 vs. 3.47), the differences due to breed effect were highly significant ($P < 0.01$). Also, eye muscle area (Longissimus dorsi) was higher in Farafra than Chios lambs (11.91 vs. 11.42 cm^2), and the differences were highly significant ($P < 0.01$). The mean eye muscle area of the Farafra was 4.11% larger ($P < 0.01$) than that of Chios lambs. This result is consistent with assumption of the Farafra being an earlier maturing type.

These results agree with El-Mahdy *et al.*, (2000) that the lean, fat and bone percentages were 54.70, 16.00 and 26.10% for Ossimi lambs and 58.60, 14.00 and 24.50% for $\frac{1}{2}$ Ossimi \times $\frac{1}{2}$ Rahmani, respectively. But, the differences between breed groups were significant. Negussie *et al.*,

(2004) found that genotype (Herro and Menz lambs) had a significant effect on weight of carcass lean ($P < 0.05$) and bone ($P < 0.01$). However, there was no significant difference in dissectible body fat content between the two genotypes. While, Abou-Ammou (1992) found that Rahmani (R) lambs had higher lean/fat ratio than $\frac{1}{4}$ Rom \times $\frac{3}{4}$ Rahmani and $\frac{1}{4}$ Finn \times $\frac{3}{4}$ Rahmani (FR), but the cross breed $\frac{1}{4}$ Rom \times $\frac{3}{4}$ Rahmani (RoR) had higher ratio between lean and fat than the cross breed (FR) lambs. The lean/fat ratio was 8, 2.6 and 4.2 for R, FR and RoR, respectively while, the lean/bone ratio was lowest in Rahmani and higher in crossbred lambs (2.8 vs. 3.1). El-Mahdy *et al.*, (2000) recorded that the lean/fat ratio was 2.95 and 3.86. However, the lean/bone ratio was 2.40 and 2.60 for Ossimi and $\frac{1}{2}$ Ossimi \times $\frac{1}{2}$ Rahmani, respectively, but the differences were not significant.

Feeding system: Weight of 9, 10 and 11th ribs cut of the group 3 (15% hay) carcasses was higher by 7.73 and 8.66% compared to those of group 2 (6% hay) or group1 (0% hay). But, differences due to hay levels in the ration were not significant. The same trend was observed for sample meat weight, sample fat weight, sample meat percentage, boneless meat percentage; meat: fat ratio, meat: bone ratio, coefficient of meat, eye muscle area, meat in carcass and fat in carcass. On the contrary, sample bone percentage tended to decrease

with hay inclusion in the ration either at 6 or 15% levels. The three hay levels had no significant effect on meat, fat and bone percent for 9, 10 and 11th ribs cut. The high hay level in the ration had a higher meat percentage (54.22%) than full concentrate ration (53.27%). While, bone percent decreased as the levels of hay in the ration increased (20.72, 20.01 and 19.13% for 0%, 6% and 15% hay, respectively). Fat percentages were 26.01, 26.97 and 26.65 for 0, 6 and 15% hay groups, respectively. The boneless meat and coefficient of meat increased as the hay level in the ration increased. Eye muscle area recorded 11.75, 11.58 and 11.67 cm² for 0, 6 and 15% hay groups, respectively. But carcass meat was greater at 15% hay level (11.16 kg) than at 6% hay level (10.23 kg) and at 0% hay level (10.16 kg). The carcass fat was 5.07, 5.53 and 5.65 kg for 0, 6 and 15% hay, respectively. While, carcass bone was nearly of similar figures (Table 3). Also, the meat/fat ratio and meat/bone ratio increased by increasing hay levels (2.16, 2.21 and 2.32 and 2.66, 2.69 and 2.97 for 0, 6 and 15% hay groups, respectively). Also, Abou-Ammou (1992) found that the two feeding levels had no significant effect on physical composition percentage (lean, fat and bone percent from 9-10-11th ribs cut). The low concentrate ration had better lean percent than the high concentrate ration (52.9 vs. 50.9%). While, fat percentages showed similar

values (27.2 vs. 27.1%). The bone percent was higher in high concentrate ration than in low concentrate ration (18.3 vs. 16.4%). She added that when a low feeding level of concentrate ration was offered, the ratio between lean and fat was 2 : 1 and the lean/bone ratio was 3.2:1. However, using high concentrate ration had a ratio between lean/fat (2 : 1) and decreased with increasing the feeding level (1.8 : 1).

Fimbres *et al.* (2002) found that the level of hay in the ration did not affect fat thickness, rib eye area fat. Similarly, El-Bedawy *et al.*, (2004) reported that roughage level had no significant eye muscle area, eye muscle weight and physical composition of the best 9, 10 and 11th ribs. They recorded that eye muscle area was 20.5 and 21.5cm² for lambs fed low and high roughage rations, the lean, fat and bone percent were 62.5, 23.4 and 14.1% for lambs fed low roughage ration (10% hay). But, they were 61.5, 25.1 and 13.4% of lambs fed high roughage ration (30% hay), respectively.

Chemical analysis

Breed effect: Data in Table (3) showed that the percentage of moisture was slightly higher (72.75%) in Farafra than Chios (71.37). Also, Farafra had higher protein percentage (73.77%) and ash percentage (3.10%) than Chios (71.86% and 2.99%, respectively). However, Chios had higher percentage of ether extract

(25.15%) than Farafra (23.05%). But, the differences in chemical composition between genotypes were not significant. These results are in agreement with the results of El-Mahdy *et al.*, (2000) except in fat percentage of local lambs.

Feeding system: Data in Table (3) showed that differences in chemical composition due to hay level in the ration were not significant. These results are agreement with El-Bedawy *et al.*, (2004) that roughage level showed no significant effect on chemical composition of eye muscle. They reported that dry matter, crude protein, ether extract and ash were 33.58, 63.75, 33.25 and 3.00% for lambs fed low roughage ration (10%) and were 32.83, 65.62, 31.41 and 2.97% for lambs fed high roughage ration (30%), respectively.

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تغذية حملان الفرازة و الكيوس النامية على علائق تحتوي على مستويات مختلفة من دريس البرسيم 2- صفات الذبيحة

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تم إجراء هذه التجربة في محطة بحوث الإنتاج الحيوانى بملوى التابعة لمعهد بحوث الإنتاج الحيوانى لتقييم صفات جودة الذبيحة بعد التسمين المبكر لمدة 105 يوم. حيث تم ذبح (18) حمل بعد التسمين (9 حملان فرازة و 9 حملان كيوس) والمغذاة على ثلاث مستويات مختلفة من الدريس (صفر% و 6% و 15% دريس). لم تظهر النسب المختلفة من دريس البرسيم فروق معنوية على مختلف صفات الذبيحة ، تم تسجيل وزن الذبيحة فى حملان الفرازة 21.61 كجم بينما كان وزن ذبائح حملان الكيوس 17.79 كجم، و كان هناك اختلافات عالية المعنوية فى نسبة التصافى على أساس الوزن الحى و كانت أفضل فى حملان الفرازة (50.11%) عنها فى حملان الكيوس (47.89%). وكانت نسبة القطيعات الممتازة فى حملان الكيوس 79.11% و فى حملان الفرازة 75.89% ، و لكن وزن قطعيات الذبيحة فى حملان الفرازة كان أعلى من حملان الكيوس. أيضاً تفوقت حملان الفرازة على حملان الكيوس معنوياً فى الأجزاء المأكولة. كانت نسبة اللحم: الدهن 2.43 و 2.02 فى حملان الكيوس و الفرازة على التوالى ، و لكن نسبة اللحم : العظم كانت 2.33 و 3.21 فى حملان الكيوس و الفرازة على التوالى. زادت مساحة العضلة العينية معنوياً (0.01) فى حملان الفرازة (11.91) عن حملان الكيوس (11.42). أظهرت النتائج أنه لا توجد فروق معنوية لنسب دريس البرسيم المختلفة على مكونات قطيعة الأضلاع 9، 10، 11 من اللحم والدهن والعظام.