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Determination of Fattening Performance and Carcass Characteristics of Awassi x (Romanov x Awassi) G_1 Hybrid Male Lambs

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Key words
Awassi, Romanov, Lamb feeding, Carcass, Dressing percentage.

ABSTRACT

The present study was conducted to investigate the fattening performance and carcass characteristics of Awassi x (Romanov x Awassi) G_1 crossbred male lambs. In the study, seven male lambs whose weaning weights were almost similar were included in the experiment. The lambs were weaned at 2 months of age. They were fed with ad libitum concentrated feed and 100 g/day wheat straw was given to each animal during the fattening period of 64 days. During the fattening period, it was determined that daily live weight gains in lambs were 0.278±0.019 kg and feed conversion ratio were 4.79. The average final live weight, cold carcass weight, dressing percentage, leg ratio, foreleg ratio, tail ratio and cooling loss of lambs were found as 33.62±0.968 kg, 14.91±0.627 kg, 44.67±0.008%, 33.76±0.326%, 18.94±0.468%, 4.98±0.467% and 4.99±0.135%, respectively. In conclusion, the present results indicated that daily live weight gain, feed efficiency and valuable carcass fractions of Awassi x (Romanov x Awassi) G_1 crossbred male lambs were found similar to the corresponding values of Awassi breed.

INTRODUCTION

Income from sheep is mainly associated with health and fertility. For this reason, high fertility is among the primary targets of sheep breeders. It is extremely difficult to provide genetic progress as a result of having low heritability of fertility. In this case, many of the low-fertile domestic breeds should be crossed with high yielded breeds to produce high fertility-efficient crossbreeds in a short time (Aksoy *et al*., 2019).

The relatively small sized Romanov breed has a high fertility, high milk yield and low maintanence requirements in terms of large sheep breeds. Due to these properties, Romanov sheep breed is widely adopted in many countries of the world in order to increase fertility of the indigenous breeds. High fertile cross-breeds are obtained by mating low yielded ewes with Romanov rams in many countries.

There is a growing interest on meat yield in sheep breeding compared to other yields in order to meet fundamental protein requirements of the healthy human generations. Several previous studies have been conducted for fattening performance and carcass characteristics in cross-breed genotypes obtained based on the Romanov. Among those, Shaker *et al*. (2002) determined that F_1 lambs produced by mating Awassi ewes with Romanov and Charollais rams had better daily weight gain, total weight gain and feed conversion rates than the pure Awassi lambs.

Growth performance, slaughter and carcass characteristics were reported in the earlier studies conducted by Abdullah *et al*. (2010) on the Awassi, Charollais x Awassi (F_1) crossbred, Romanov x Awassi (F_1) cross, Awassi x (Charollais x Awassi) (G_1), and Awassi x (Romanov x Awassi). The previous study indicated that Charollais x Awassi crossbred lambs showed better growth performance than other genotype groups and revealed that the F_1 carcass composition of the lambs was better compared with that of the Awassi lambs, whereas the G_1 had a carcass composition in the middle of those two groups. Barzdina and Kairisa (2016) informed that the growth rates of Dorper x Romanov crossbred lambs were found higher than pure Romanov lambs and reported that the crossbred lambs had lower carcass yield, carcass length and meat-bone ratio than pure parents.

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Romanov sheep known for its high fertility is an important option for mating to improve the fertility of native breeds and lamb meat production. In literature, more detailed studies on various sheep breeds and crossbreds are still required. Therefore, an attempt is made in the present investigation to ascertain fattening performance and carcass characteristics of Awassi x (Romanov x Awassi) G_1 crossbred male lambs.

MATERIALS AND METHODS

The present research was conducted on Dicle University, Department of Animal Science Sheep Research Center. In the study, seven Awassi x (Romanov x Awassi) G_1 cross lambs with a weight close to each other born within 4 days from 2 age of ewes at birth season. Experimental lambs were fed for 64 days at closed barn of 45 m^2 (15x3). At the beginning of the fattening, the lambs were weighted 3 days after 12 h starvation in the morning and the average of the lambs in the weight was accepted as the average live weight. During the experiment, all lambs had *ad libitum* to access to concantrete, 100 g/d wheat straw and fresh water. The results of the nutrient analysis of concantrete feed used in the diet comprised crude fat, 3.08%; dry matter, 89.225; crude protein, 16.515; crude cellulose, 7.205; crude ash, 7.215; sodium, 0.255; metabolic energy, 2821 kcal/kg; vitamin A, 15.00 IU/kg; vitamin D_3, 3.00 IU/kg; vitamin E, 30 mg/kg and vitamin B_1, 5 mg/kg.

The fattening trial started at the average of 61 days old lambs. The initial weight and weights at 20th, 35th, 50th and 65th days were weighted and reported after 12 h starvation by the digital scale 10g sensivity. The experiment lasted 64 days. Data concerning daily liveweight gain and feed intake was calculated. Feed concumption and feed intake was calculated at the group level due to group feeding applied in fattening.

The final weight of lambs was accepted as a result of 3 days weighted performed. At the end of the trial, all the lambs were slaughtered to determine slaughtering and carcass characteristics. The dressed carcass comprised the body after removal of the head, skin, fore and hind feet, tail, kidney, kidney fat and the visceral organs were weighted by the digital scale 10g sensitivity and hot carcass weights were weighted by the digital scale 50g sensitivity. After carcasses were chilled at 4°C for 24 h, the cold carcass, kidney, kidney and pelvic fat and tail weights were obtained. Carcass dressing was performed on the basis of the method reported by Colomer-Rocher *et al*. (1988). First, carcass was divided into two equal sides through the centre of the backbone and the dressing process was performed on the left half carcass. The neck, shoulder, loin-rib, loin-skirt and leg were separated and the weight of each dressed carcass parts were weighted by the digital scale 10 g sensitivity.

RESULTS AND DISCUSSION

Live weight and live weight gain

In addition to initial weight of lambs (5.10±0.46 kg), descriptive statistics for live weights at 80th, 95th, 110th and 125th days was respectively 16.09±0.75, 21.70±0.73, 24.93±1.05, 29.30±1.37, and 33.62±0.96 kg. Descriptive statistics for consecutive weights between live weights were shown in Table I. The highest daily liveweight gain of 0.30 ± 0.014 was obtained from initial to 80th day. It is understood that the lowest daily liveweight gain (0.23 ± 0.03) was achieved between the days 81-95. The regression of the liveweights of lambs to fattening periods was calculated and the coefficient of determination (R^2) of the regression equation was found as 0.99. According to this value, liveweights of lambs increased linearly during the fattening period.

Table I.- Daily live weight gain (kg), feed consumption (kg/day) and feed intake counts (feed consumption/ kg increase) for various periods of feeding 64 days of Awassi X (Romanov X Awassi) G_1 lambs.

Age periods (day)	Daily live-weight gain ($X \pm S_x$)	Feed intake (kg/day)	Feed efficiency
Birth-Initial	0.18±0.007	-	-
Initial-80th day	0.30±0.014	1.12	3.71
81-95	0.22±0.03	1.38	6.42
96-110	0.29±0.04	1.30	4.48
111-125	0.29±0.07	1.31	4.53
During fattening (61-125 day)	0.28±0.02	1.29	4.79

Final live weight results were in agreement with those reported by Sireli and Tekel (2013) and Tekel *et al*. (2007) in Awassi lambs. However, the present results were lower reported by Shaker *et al*. (2002) in Awassi and Romanov x Awassi (F1) lambs as well as Shaker *et al*. (2003) in Awassi sheep.

The daily live weight gain values obtained during the fattening period in the present study showed similarity with those informed by Tekel *et al*. (2010), Sireli and Tekel (2013) and Shaker *et al*. (2003) in Awassi lambs, whereas the present daily weight gain was found higher compared with those reported by Shaker *et al*. (2002) in Awassi x Romanov (F_1) cross lambs.

The highest growth rate and feed efficiency in the present study were achieved during the first period of

fattening (61-80 day of age). A similar situation was also observed in the study conducted by Dikmen *et al*. (2009) who recorded that Awassi lambs showed higher liveweight gain in the first 14 days of the fattening than the following periods. In case of feed insufficiency during growth period, the growth rate stays below normal growth rate. Growth rates increase when these animals are fed enough with the suitable ratio so that they can gain liveweight much faster than their peers at the beginning of the period when the feeding restriction is over. This situation is called compensatory growth (Akçapınar and Özbeyaz, 1999).

The high growth rate of the crossbred lambs at the beginning of the fattening means that lambs may be undernourished before the fattening period. So that the rapid daily weight gain in the first period may be regarded as compensatory growth. However, the high rate of growth experienced during the first (initial-80th day) period can not be explained by the compensatory growth. Because the daily live weight gain of lambs from birth to weaning time supported those reported by Sireli and Tekel (2013) for pure Awassi lambs, but was higher than Abdullah *et al*. (2010) for Romanov x Awassi crossbreds. Besides, there was no food deficiency during the growth period in fattening. Because during the growing period of lambs, 600 g concentrate was added in weaned period per day in addition to breast milk. It may be more appropriate to explain this situation which is detected in the survey in terms of uncontrolled short-term environmental conditions rather than compensatory growth. Sheep shows some reactions to protect against hyperthermia when the temperature climbs too high and ambient temperature goes out of 10-15°C (comfort zone). At the same time such exposure of sheep to heat stress evokes a series of drastic changes in the biological functions which include a decrease in feed intake efficiency and utilization, disturbances in water, protein, energy and mineral balances, enzymatic reactions, hormonal secretions and blood metabolites (Al-Haidary, 2004; Marai *et al*., 2007). The amount of feed intake during different periods has fallen after 81-95 days of fattening. This may be attributed to the increased temperature in this period of fattening between the May-June in Diyarbakir province of Turkey.

Feed intake and feed efficency

Daily feed intake and feed efficiency during fattening in different periods are presented in Table I. The average feed intake was found 1.295 kg/day in trial and 4.79 kg of feed was consumed to produce 1-kilogram gain in live weight. The highest daily feed consumption and the lowest feed efficency were obtained at 2nd period of fattening between the 81-95 days. Feed evaluation and feed consumption values of crossbreed lambs in the present study were found to be similar to those reported by some earlier authors (Sireli and Tekel, 2013; Shaker *et al*., 2002, 2003; Abdullah *et al*., 2010). The highest daily feed intake and the lowest feed efficiency were achieved found at 2nd period in 81-95 days of fattening. Feed efficiency and feed intake values of lambs were determined to be similar to those reported given in some previous studies (Sireli and Tekel, 2013; Shaker *et al*., 2002, 2003; Abdullah *et al*., 2010).

Slaughter and carcass characteristics

Descriptive statistics of slaughter characteristics of lambs at the end of fattening are presented in Table II. The slaughter weights determined in this study were found lower than those reported by Sireli and Tekel (2013) in Awassi male lambs weaned at 2.5 months and 60 days of fattening, Tekel *et al*. (2007) in Awassi male lambs weaned 2 months and 60 days of fattening, Shaker *et al*. (2003) in Awassi male lambs taken for fattening in 61 days, Haddad and Husein (2004) in Awassi lambs for 62 days of fattening and Shaker *et al*. (2002) in the Romanov x Awassi for 62 days of fattening, respectively. The present values achieved for most of the slaughter characteristics of lambs were found similar to those reported for Awassi lambs by several previous authors (Sireli and Tekel, 2013; Kul and Seker, 2002; Kul and Akcan, 2002; Tekel *et al*., 2007).

Table II.- Average values of the cutting characteristics and the ratio of these characteristics to the cutting live weight of Awassi X (Romanov X Awassi) G_1 lambs.

Characteristics	Weight (kg) X ± $S_{\bar{x}}$	Characteristics	Ratio in cold carcass weight (%)
Slaughter weight	33.60±0.95	Dressing percentage (in chilled carcass)	44.67±0.01
Hot carcass weight	15.69±0.67	Head percentage	5.76±0.14
Head weight	1.93±0.06	Four-feet percentage	2.49±0.06
Feet weight	0.84±0.03	Pelt percentage	12.62±1.64
Pelt weight	4.19±0.46	Omental fat percentage	1.02±0.17
Omental fat weight	0.35±0.07	Testicle percentage	0.51±0.07
Testicle weight	0.17±0.02	Heart, lungs, liver and trachea percentage	4.67±0.06
Gastro-intestinal tract weight	1.57±0.03		

Table III.- Mean values of cold carcass, carcass parts weight and carcass weight ratio of cold-carcass weight of Awassi X (Romanov X Awassi) G_1 lambs.

Characteristics	Weight (kg) $\bar{X} \pm S_{\bar{x}}$	Characteristics	Ratio in cold carcass weight (%)
Chilled carcass weight	14.91±0.62	Leg percentage (double)	33.76±0.32
Kidney weight	0.11±0.004	Foreleg percentage (double)	18.94±0.46
Kidney fat weight	0.19±0.01	Neck percentage (in left half carcass)	3.55±0.39
Tail weight	0.75±0.08	Tail percentage	4.98±0.46
Leg weight (single)	2.51±0.08	Back-loin percentage (in left half carcass)	15.76±0.69
Back-loin weight (in left half carcass)	1.18±0.09	Chilling loss percentage	4.99±0.13
Foreleg (single)	1.41±0.04		
Shoulder weight (in left half carcass)	0.34±0.05		
Neck weight (in left half carcass)	0.26±0.03		
Flank-breast weight (in left half carcass)	0.78±0.08		

Slaughter weight ratios of the slaughter characteristics are given in Table II. The carcass yield, pelt, tail ratio and chilling loss determined in the present study were found lower than those reported for pure Awassi lambs by previous authors (Sireli and Tekel, 2013; Kul and Seker, 2002; Tekel *et al*., 2007). The lunch+trachae+liver+heart ratios found in the present study were found lower than those reported by Kul and Seker (2002); however, similar results were also reported by Sireli and Tekel (2013) and Tekel *et al*. (2007). In addition, head and feet ratios in the present study were in agreement with those obtained by some previous authors (Kul and Seker, 2002; Tekel *et al*., 2007; Sireli and Tekel, 2013). Higher testicle ratio was noted compared with those recorded by other authors.

The chilled carcasses were dressed in terms of the method described by Colomer-Rocher *et al*. (1988) and descriptive statistics for the weight of dressed organs are given in Table III. The present chilled carcass and tail weights were found lower in comparison with those reported by some earlier authors (Kul and Seker, 2002; Tekel *et al*., 2007; Sireli and Tekel, 2013). However, the kidney weights were found similar. In addition, leg, shoulder, back and loin weights were obtained lower than those found by Kul and Seker (2002), similar results were also reported by Tekel *et al*. (2007) and Sireli and Tekel (2013). The present neck weight was lower than those informed by Tekel *et al*. (2007) and Sireli and Tekel (2013).

The ratios of carcass parts to cold carcass weights are given in Table III. The present rates were found similar for Awassi and Tahirova x Ivesi (F_1) cross lambs reported by Kul and Seker (2002). In addition, the present tail ratio of the lambs was lower than that determined by Kul and Seker (2002) in Awassi lambs.

Final-fattening and slaughter weights of lambs were found similar to those recorded in Tekel *et al*. (2007) and Sireli and Tekel (2013) for pure Awassi lambs while carcass weight and cold dressing percentage was lower. Low ratio of tail weight to chilled carcass weight, high ratio of omental fat and testicle weight negatively affects carcass yield. The carcass dressing ratio of the crossbred lambs was found less than the values reported by Tekel *et al*. (2007) and Sireli and Tekel (2013). It may due to lower tail weights, higher testicle and omental fat weights. As a matter of fact, there are a number of studies in which the weight of lambs obtained from crossbreeding between fat-tailed breeds and tailess breeds is lower since that of fat-tailed parents and the weight of omental fat is higher (Ertuğrul *et al*., 1998; Özbey and Akcan, 2003). In addition, Shaker *et al*. (2002) and Abdullah *et al*. (2010) informed that the testicle weight of F_1 crossbred lambs were higher than that of pure Awassi lambs.

The Romanov sheep is also well known for its low carcass quality as well as high fertility. For instance, in fattening studies conducted with pure Romanov male lambs in Russia, poor carcass quality was reported (Vrakii and Gushchin, 1985; Al-Lakham, 1990). On the other hand, it was reported that, in the previous study conducted in France, the pure Romanov and Romanov crossbreed lambs have significantly altered the muscles of the cross in 25-150 day old lambs when using appropriate breeds. The carcass characteristics of the Romanov crossbreds can be improved considerably, but no standard breed is determined for comparison (Teyssier and Prud'hon, 1982; Fahmy, 1997).

In a study by Fahmy (1997), with the Romanov and Booroola Merino x DLS (Dorset x Leicester x Suffolk), the lambs from each group were slaughtered from 10 to 34 weeks, with 4-week intervals. Romanov lambs slaugtered after 18 weeks had higher shoulder ratios (about 2%) and lower back and leg than the other group. Shaker *et al*. (2002) and Abdullah *et al*. (2010) found that in Romanov x Ivesi (F_1) cross, cold carcass, arm and back weights were

higher than pure Awassi. In addition, Abdullah *et al*. (2010) reported that Romanov x Ivesi (F_1) cross lambs had a high meat/bone ratio. The cold carcass weight (14.91±0.62) obtained in this study was lower than those reported by Sireli and Tekel (2013) and Tekel *et al*. (2007) in pure Awassi lambs, whereas leg, shoulder, back, loin weights were found similar to those obtained in the present study. However, the tail weights reported by Sireli and Tekel (2013) and Tekel *et al*. (2007) were higher (2.14±0.27 and 2.29±0.27). When weights of tailless carcasses are evaluated, it was understood that the present results were similar to those obtained in pure Awassi lambs.

CONCLUSIONS

The present results revealed that daily liveweight gain, feed efficency and valuable carcass fractions of Awassi x (Romanov x Awassi) G_1 crossbred male lambs were found similar to the corresponding values of Awassi breed. It is also possible that the Awassi x (Romanov x Awassi) G_1 crossbred male lambs allow the breeder's income to increase relative to pure Awassi in relation to the fertility characteristics.

Statement of conflict of interest

The authors declare no conflict of interest.

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