GROWTH PERFORMANCE AND CARCASS QUALITY ASSESSMENT OF PUREBRED AND CROSSBRED ROMANOV LAMBS

Nawzad. M. Aziz[1]   Dvalishvili. V. G. [2]

[1]Department of Animal Resources, College of Agriculture Engineering Sciences, Salahaddin University-Erbil, Kurdistan Region, Iraq.
[2]Department of Breeding and Nutrition, All-Russian Research Institute of Livestock, Academician L. K. Ernst, Moscow, Russia.
E mail: nawzad.aziz@su.edu.krd

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ABSTRACT

The present study aimed to examine the growth performance and characteristics of carcass quality of purebred and crossbred Romanov male lambs (3/4 Romanov × ¼ Edilbai). A total of 40 male lambs (3 months aged) from two different genotypes (20 of each genotype) were used. Lambs were reared under the same management system for 8 months of age. The growth and characteristics of carcass as hot and cold weight of carcass, dressing percentage and carcass composition were determined for each group of lambs. The results indicated a significant difference (P≤0.05) in growth traits between purebred and crossbred Romanov lambs. The crossbred Romanov lambs had significantly higher final body weight and weight gain per day compared to purebred Romanov lambs. Moreover, a significant increase was recorded for all carcass traits in Romanov crossbred lambs compared with purebred Romanov lambs. Due to high production and carcass traits, Romanov crossbred lambs can be used for the production of meat purposes. However, further investigations of these crossbred lambs need to be evaluated before any recommendation is given.
Keywords: carcass traits, crossbreeding, growth performance, sheep.

INTRODUCTION

In Russia, a significant subjects dealing with sheep production is breeding of sheep. The major objective of all breeding programs aimed to organize good profitable sheep flocks which have been identified as a significant agriculture area providing the human with meat and milk as well as essential raw materials (wool, skin) which are economically and strategically important for Russia (Dvalishvili *et al.*, 2015).

Romanov, the predominant sheep in Russia, one of the economically most important profitable sheep breeds characterized by several desirable traits such as this sheep genetically distinct breeds because (1) the breeds carry pure genes; (2) the breeds do not produce from any crosses and (3) the breeds are an extremely reproductive and productive performance with high yielding lamb, as a Romanov ewe able to produce seven live and healthful lambs in a single litter (Korkmaz and Emsen, 2016). Romanov sheep, however, cannot meet the requirements of either breeders or customers because their lambs are poor in performance and carcass yield (Khaldari and Ghiasi, 2018; Zapasnikienė, and Nainienė, 2012). To overcome

such problems, Romanov sheep need crossing strategies with breeds of sheep which have high growth rate and meat productivity.

   Edilbai sheep breed is originated in southwestern Asia and classified as a meat-fat breed. They characterized by a strong constitution, high feed conversion efficiency and meat productivity, great hardiness to adverse conditions of management so they can be reared in harsh deserts and semi-desert areas (Fathala *et al.*, 2014). This sheep breed has spread to many countries in the world of which Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan, then China, Afghanistan, Iran, Turkey, the countries of the Arabian Peninsula and in Africa. In Russia, at the last 20 years, there has been some interest in the meat-fat Edilbai breed, which has a high maturity, good meat quality and excellent adaptation to the adverse circumstances of management and feeding. Therefore, the current study was carried out to assess growth performance and quality of carcass in crossbred (3/4 Romanov: 1/4 Edilbai) and purebred Romanov male lambs.

MATERIAIS AND METHODS
Animals and experimental design
   Forty Romanov male lambs (3 months aged) with an average body weight of 22.5 ± 1.17 kg reared under same management system and obtained from All-Union Scientific Research Institute of Animals (VIZH), Moscow, Russia were used in the study. Based on their genotype, animals were assigned into two groups of twenty animals of pure Romanov lambs and twenty crossbred Romanov lambs of Romanov ewes intermarriage with Edible ram (3/4 Romanov × ¼ Edilbai). Lambs were housed into two individual and good ventilation pens bedded with wood shavings within the same house after they identified using plastic ear tags. During the 80 days of the treatment period, two balanced diets were formulated for the first (3-6 months) and second (6-8 months) halves of the period of fattening. Feed composition (Table 1) was prepared for both fattening periods to meet the requirements of all nutrients for lambs. The diet was involved two main components which were concentrates and green fodders (Alfalfa). The concentrate ration consisted of wheat, barley as well as oats as a protein source and salt and mineral premix as dispenser and mineral additives.
Growth performance
   Final body weights for both genotypes of lambs were recorded at the start of the experiment while fasting and monthly thereafter until the end of the experimental period. Additionally, the average daily weight gain was recorded basis on the rate of weight gain per day over a specified period.

Slaughtering procedures and carcass measurements
   At the end of the experiment, the lambs were weighed and slaughtered to determine slaughtering and carcass characteristics. Upon slaughter, hot carcass weights were weighed (HCW) after removal of the head, skin, fore and hind feet, tail, kidney, kidney fat and the visceral organs. After carcasses were chilled at 4 °C for 24 h, the cold carcass weights were obtained (CCW). The difference between hot and cold carcass weight was estimated as percentage of chilling loss. Dressing percentage was calculated by dividing the HCW or CCW by the slaughter weight of

the animal and expressing the result as a percentage. Carcass were divided into two equal right and left sides through the center of the backbone. The neck, shoulder, breast, flank, loin and leg cuts were separated from right part of the carcass and each cut was dissected into lean, fat and bone on the basis of the procedure reported by Khaldari and Ghiasi (2018). The fat that surrounded the intestine and abdomen were considered the abdominal fat, while the fat surrounded kidney and pelvic were considered internal fat (Fathala *et al.*, 2014).

Table (1): Composition and nutrient content of diets for lambs from 3 to 8 months of age (%, as fed-basis)

Indicator	Romanov	Romanov× Edilbai	Romanov	Romanov × Edilbai
	Age, month			
	3 - 6		6 - 8	
Green fodders, kg /head/day	2.77	3.06	3.60	3.85
Concentrates, g /head/day	550	550	750	750
The chemical composition of diet, DM basis[1]				
Dry Matter, kg	1.47	1.57	1.89	1.98
Energy metabolism, MJ	16.33	17.44	19.62	20.55
Crude Protein, g	222	236	283	296
Digestible crude protein, g	163	174	196	206
Crude fat, g	56	60	72	76
Crude fiber, g	219	240	287	305
Nitrogen-free extract, g	712	757	943	983
Calcium, g	8.4	9.0	10.9	11.7
Phosphorus, g	5.8	6.2	10.2	10.9
Sulfur, g	4.7	5.0	6.6	7.1
Carotene, mg	85	89	120	128
Digestible crude protein, g	1.63	1.74	1.96	2.06

[1]Diets were formulated using FeedLIVE software (FeedLIVE 1.52, Thailand).

Statistical analyses

The experiment was carried out according to the completely randomized design and data obtained for all parameters were analyzed by the generalized linear model (GLM) procedure of Anonymous (2003). The differences among means were tested with independent sample T-test at level of 0.05. Characteristics were expressed as mean ± standard errors. Differences among means were tested using Duncan test (Steel and Torrie, 1984).

RESUITS AND DISCUSSION
Growth performance

The results of growth performance of lambs such as average daily gain and body weight of the two genotypes are presented in Figure 1. Differences ($P \leq 0.05$) were evident between the average daily gain and body weight of the purebred and crossbred Romanov lambs because the crossbreds lambs had better daily weight

gain and final body weight of about 18 and 13 % in comparison with purebred lambs, respectively. The result of crossing the purebred Romanov lambs were showed enhancement of the growth performance. In Russia federation, growth rate performance of the purebred lambs reflected as the main issue meeting pure-breeding sheep expansion, especially for Romanov breed. This finding is in tandem with those of Khaldari and Ghiasi (2018) and Dvalishvili *et al.,* (2015) who reported an increase daily gain for lambs from Romanov crossbreed compared to purebred Romanov lambs. The data obtained by Dvalishvili *et al.,* (2015) and Fathala *et al.,* (2014) showed that crossbred Romanov lambs significantly improve the body weight than that of the purebred Romanov lambs. It seems that the superiority of crossbred lambs in relation to purebred lambs in terms of body weight gain is caused by the effect of hybrid vigor (Khaldari and Ghiasi, 2018). In numerous countries especially where lamb meat production is of primary importance, commercial crossbreeding programs have been widely applied to produce efficient lambs for slaughter purposes. This can be got by enhancing daily weight gain during the fattening period by means of appropriate crossbreeding programs (Esmailizadeh *et al*., 2012).
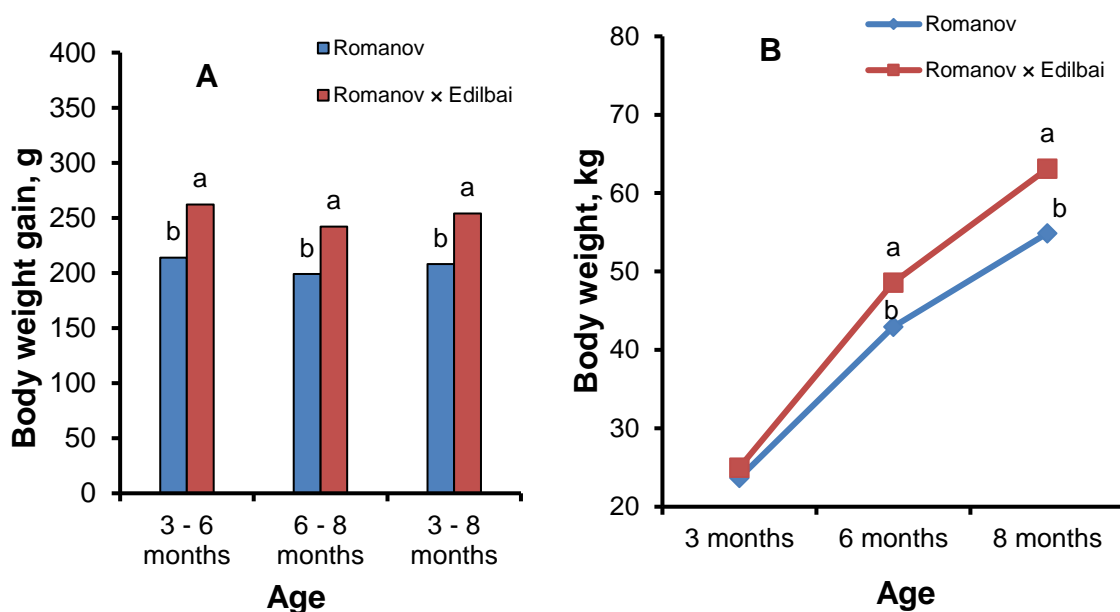

Figure (1): Daily average growth (A) and body weight (B) of purebred and crossbred Romanov lambs.

[a,b]Means are significantly different at $p \leq 0.05$.

Carcass quality

Carcass is the body of an animals butchered for meat. The term is used following dressing that is, the removal of various parts from the body after butchering (Adzitey, 2011; Kadim *et al.*, 2008). In lambs, the characteristics of carcass including hot carcass weight, cold carcass weight and dressing percentage are determined by many factors such as breed, slaughtering weight, feed and weaning age (Ekiz *et al.*, 2012). An indicator for significant efficacy of lambs and

their ability for meat production is improvement carcass yields characteristics. The quality characteristics of carcass of purebred and crossbred Romanov lambs are shown Table 2. The mean values for traits such as hot carcass weight, cold carcass weight and carcass yield or dressing percentage were significantly differences (p≤0.05) between lambs groups and the crossbred Romanov lambs had the higher values than purebred ones. The difference between the purebred and crossbred Romanov lambs could be due to the variance of slaughter body weight (Table 2) that is affected by genetic factors. According to Khaldari and Ghiasi (2018), the superiority of the Romanov crossbred lambs is likely due to the genetic structure of these breeds for body size and body weight. The abdominal fat and the kidney and pelvic fat as well as chilling loss (Table 2) were not influenced (p≤0.05) by genotype. This finding is consistent with those of Fathala *et al*., (2014) who found difference (p≤0.05) between genotypes of sheep (Romanov lambs and crossbred lambs Edilbai × Romanov) on quality characteristics of carcass such as carcass weight and dressing percentage. Also, Dvalishvili *et al.* (2015) reported that crossbred Romanov lambs had higher lamb carcass weight and carcass yield than purebred ones. Santos-Silva *et al.* (2002) stated that slaughter weight and carcass weight of lambs were significantly affected by genotype of the lambs.

Table (2): Carcass traits of purebred and crossbred Romanov lambs.

Indicator	Breed group	
	Romanov	Romanov × Edilbai
Pre-slaughter weight, kg	52.76 ± 0.37^b	61.88 ± 0.54^a
Hot carcass weight*, kg	26.55 ± 0.31^b	32.60 ± 0.42^a
Cold carcass weight*, kg	25.21 ± 0.31^b	30.98 ± 0.42^a
Chilling loss, %	1.34 ± 0.08	1.62 ± 0.07
Dressing percentage[1]	49.64 ± 0.29^b	52.86 ± 0.47^a
Dressing percentage[2]	47.78 ± 0.22^b	50.07 ± 0.36^a
Abdominal fat, kg	1.34 ± 0.07	1.97 ± 0.12
Kidney and pelvic fat, kg	0.15 ± 0.04	0.18 ± 0.07
Fat tail, kg	-	0.42 ± 0.05

[1]is calculated as (hot carcass weight / slaughter weight) × 100
[2] is calculated as (cold carcass weight / slaughter weight) × 100
[a,b]Means with different letters are significantly different at p≤0.05.

The measurements of the lean and fat content are used to determine carcass value (Knight *et al.*, 2020; Anderson *et al.*, 2015). The carcass obtained from crossbred lambs had significantly more tissue of lean and fat. Nevertheless, the values of bone obtained from purebred or crossbred Romanov carcass lambs were not significantly different (p>0.05) (Table 3). Consequently, the ratio of meat to bone was more by 16%. The carcass values are affected by the ratio of muscle: bone at a particular fat level. Obviously, a higher ratio is preferable as it equates to more saleable lean meat as well as highest carcass conformation (Irshad *et al.*, 2013). The results could be due to the effect of crossbreeding upon the meat production of the lambs. Crossbreeding improved carcass traits via reducing the body fat (Dvalishvili

et al., 2015). The improvement in lean value through crossing strategies is in tandem with the findings of Dvalishvili *et al.,* (2015) and Fathala *et al.,* (2014).

Table (3): Carcass components of purebred and crossbred Romanov lambs.

Indicator	Breed group	
	Romanov	Romanov × Edilbai
Lean, kg	17.20 ± 0.22^b	21.67 ± 0.36^a
Fat, kg	3.31 ± 0.10^b	4.87 ± 0.12^a
Bone, kg	4.55 ± 0.14	4.26 ± 0.22
Other tissues, kg	0.15 ± 0.04	0.18 ± 0.07
Lean / bone ratio	3.78 ± 0.09^b	5.08 ± 0.19^a

[a,b]Means with different letters are significantly different at p≤0.05.

CONCLUSIONS

The results of the current study indicate that the Romanov crossbred lambs had higher (p≤0.05) growth performance and characteristics of carcass quality than purebred Romanov. With these results, Romanov crossbred lambs may be chosen for purposes of meat production. On the other hand, prior any recommendation may be given; more investigation should be carried out to decide whether using Romanov crossbred lambs as a crossbreeding commercial line or a start for developing a new genotype.

DISCLOSURE STATEMENT

The authors declare that they have no conflicts of interest.

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تقييم اداء النمو وصفات الذبيحة لحملان الرومانوف النقية والمضربة

الخلاصة

كان الهدف من الدراسة الحالية هو تقييم الأداء الإنتاجي والخصائص النوعية لذبيحة حملان رومانوف النقية والمضربة. تم استخدام 40 حملا من السلالتين بعمر 3 اشهر(20 حمل من كل سلالة)، ربيت جميع الحملان تحت نفس نظام الادارة حتى عمر 8 أشهر. سجلت معدلات النمو وصفات النوعية للذبيحة مثل وزن الذبيحة ونسبة التصافي اضافة الى تركيب الذبيحة لكل مجموعة من الحملان. أشارت نتائج الدراسة إلى أن حملان رومانوف المضربة كانت أعلى معنويا في وزن الجسم وكذلك متوسط الزيادات الوزنية اليومية مقارنة مع الحملان رومانوف النقية. علاوة على ذلك، تم تسجيل زيادة معنوية في جميع صفات الذبيحة للحملان رومانوف المضربة مقارنة مع الحملان رومانوف النقية. بسبب الإنتاج العالي وسمات الذبيحة، حملان رومانوف المضربة قد تكون افضل لأغراض إنتاج اللحوم. ومع ذلك ، يجب اجراء مزيد من الدراسات للحملان رومانوف المضربة قبل اعطاء اي توصية.

الكلمات المفتاحية: أداء النمو، التضريب، صفات الذبيحة، الأغنام

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