Egyptian Journal of Sheep & Goat Sciences, Vol. 9 (2), P: 1- 7, August 2014

EFFECT OF CROSSBREEDING ROMANOV EWES WITH EDILBAI RAMS ON GROWTH PERFORMANCE, SOME BLOOD PARAMETERS AND CARCASS TRAITS.

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ABSTRACT

This study was performed to investigate the effect of crossbreeding Edilbai rams (E) with Romanov ewes (R) on growth performance, carcass and serum biochemical parameters as well as to compare the productive characters of the obtained crossbred ram lambs (E X R) with Romanov ram lambs. Over a fattening period of five months two groups of experimental animals each 10 lambs were compared. First group included Romanov ram lambs and the second included crossbred ram lambs.

Crossbred ram lambs gained significantly more weight. Their average daily gains exceed significantly Romanov ram lambs throughout the experiment. Digestibility coefficients of nutrients of the diet increased with crossbred lambs in the first and second growth periods, but mostly insignificant, compared to pure lambs.

Furthermore, significant increase were recorded for all carcass traits in crossbred lambs (E X R) compared with Romanov lambs including pre-slaughter weight, pair carcass weight, slaughter weight and cold carcass weight. On the other hand, no significant differences were observed between the two groups in serum biochemical parameters except slight increase in glucose level in crossbred group.

In conclusion, crossbred ram lambs (E X R) had superiority over Romanov ram lambs in all productive and carcass traits, therefore the crossbred lambs deserve further investigations.

Keywords: *Edilbai, Romanov, crossbreeding, growth performance, carcass and serum.*

INTRODUCTION

Breed diversity is a valuable resource for sheep industry. Crossbreeding systems utilize breed diversity to increase productivity comparable to purebred flocks. Crossbreeding systems vary in managerial complexity and in use of beneficial effects due to crossbred ewes and lambs (Leymaster, 2002).

Organized crossbreeding systems can optimize the use of both hybrid vigor and breed complementarity and can be utilized by flocks of all sizes (David, 2006).

In Russia in the last 20 years there is a sharp reduction in number of Romanov sheep. For this reason there was a need to set a program for early recovery of the number of animals of this breed. Members of Laboratory of Breeding and Nutrition of Sheep developed the "Program for conservation and development Romanov sheep for the period up to 2010" Zhiryakov *et al*. (2006). The program depends on the use of crossbreeding as a tool for improvement of productive traits of sheep as well as development of native sheep breeds.

An important source for increasing sheep production is crossing different breeds of sheep not only meat breeds but also with meat-fat sheep breeds which have high maturity; high feed efficiency and meat productivity.

In recent years there has been some interest in meat-fat Edilbai breed, which has a high maturity, good meat quality and excellent adaptation to the adverse circumstances of management and feeding. So the previous work continued in Moscow-Rybinsk region by crossing ewes of Romanov breed with rams of Edilbai breed. Obtained crossbred (E × R) will be bred in itself under strict culling of boor performance animals (Zhiryakov *et al*., 2006).

Edilbai sheep breed originated in Southwestern Asia and classified as 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-deserts areas. Wool of these animals classify as coarse and semi-coarse wool fiber, with high percentage of losses of dead hair fiber (Litovchenko and Vorobiev, 1969).

Benjamin (1984) reported wide distribution of Edilbai sheep breed in many areas in the world in Uzbekistan, Kazakhstan, Tajikistan, Kyrgyzstan, Turkmenistan, then China, Afghanistan, Iran, Turkey, the Balkans, the countries of the Arabian Peninsula and in Africa-Tunisia, Morocco and Algeria.

Romanov breed classified as coarse wool fiber sheep. Romanov sheep characterized with high productivity especially meat production. High fertility and polyestrous phenomena as valuable biological features of Romanov sheep on which they differ from most other breeds of sheep all over the world. Romanov sheep rams have average weight 65-70 kg, up to 100 kg, the ewes average 45-50 kg, up to 90 kg. Lambs weaned at the age 90-100 days and weighed 16-18 kg (Erohin *et al*. ,2006).

Therefore the objective of this study was to evaluate growth performance, feed digestibility, carcass traits and serum biochemical parameters of F1 crossbred lambs (E × R) that currently received and compare them with pure Romanov breed.

MATERIALS AND METHODS

Animals and experimental design:

The field experiment was performed in All-Union Scientific Research Institute of Animals (VIZH) which located in Russia-Moscow region. The experiment started at the end of July 2012 and finished in January of the next year. The experiment divided into two growth stages first continued from 3 to 6 months of age while the second period continued from 6 to 8 months of age.

For scientific assessment of productive efficiency of lambs, animals were divided into two groups of growing lambs from 3 to 8 months, 10 heads of pure Romanov ram lambs and 10 heads crossbred ram lambs (E × R). Lambs were housed in a well–ventilated building (6 x 15 meter/20 lambs) on wood shavings as a bedding, and were identified by plastic ear tags.

Lambs of the two groups received fattening ration which consists of two parts: green fodders (silage) and concentrates with free access to hay. Diet of lambs from 3 to 8 months of age (on the base of actual feed intake) is presented in table (1).

Table 1. Ration of lambs from 3 to 8 months of age (on the base of actual feed intake)

indicator	Romanov lambs	F1 Crossbred (E x R)	Romanov lambs	F1 Crossbred (E x R)
	Age, months.			
	3-6		6-8	
Green fodders, kg /head/day	2.61	2.85	3.58	3.81
Concentrates, g /head/day	450	450	650	650
	The diet contained, DM basis:			
Dry Matter, kg	1.38	1.44	1.51	1.58
Metabolizable energy, MJ	13.87	14.89	15.08	15.86
Crude Protein, g	171	182	220	228
Digestible CP, g	111	126	139	151
Crude Fat, g	46	51	69	72
Crude Fiber, g	253	281	208	223
Nitrogen-Free Extract, G	798	836	931	982
Calcium, g	7.81	8.26	8.5	8.9
Phosphorus, g	5.36	5.58	8.5	8.9
Carotene, mg	80	91	88	95

Concentrated ration consists of barley, oats and wheat, as protein feed - dispenser and mineral additives: feed mineral salt - 1% and mineral premix - 1%. 1 kg of concentrates contained 11.5 MJ metabolizable energy and 160 g crude protein. Two samples of ration were analyzed in the Laboratory of Breeding and Nutrition Department for estimation of crude protein, fat, fiber and aflatoxin level. Lambs had free access to clean fresh water.

2.2 Measures throughout the experimental period:

1. Body weight was recorded at the start of the experiment, while fasting and monthly thereafter until the end of the experimental period.
2. Average daily gain (ADG) was calculated as the difference between two successive weight divided by the days period.
3. Relative growth rate was calculated according to Broody (1945) according to the following formula:

$$RGR\% = \frac{100 \times (W_2 - W_1)}{1/2 \times (W_2 + W_1)}$$

Where W_1 and W_2 are body weight at the beginning and the end of a period.

4. Daily feed intake and feed residues throughout the first and second periods of growth estimated as dry matter and metabolizable energy.
5. Chemical analysis of feed in terms of: moisture, total nitrogen, crude fiber, crude fat, crude protein, ash, calcium, phosphorus and sulfur for estimation of digestibility coefficients.
6. The digestibility of nutritive substances composing the diets used in the experiment were determined by conducting two metabolism trails (balancing experiments) at the age of five and seven months (on3 animals of each group) by the method of Tommy (1969);
7. Measuring carcass characteristics using three lambs from every group were chosen randomly for control slaughtering at 8 months of age according to the method of Benjamin *et al*. (1987). The animals were slaughtered after 18-hour fasting. Carcasses were weighed and chilled for 20 hours at 5°C then weighed again.
8. Blood samples were collected by jugular vein puncture two hours post feeding from all lambs under study, after carrying out the 2nd balancing experiment at age of 7 months. About 5 ml blood was drawn from each animal without anticoagulant to collect serum for determination of biochemical parameters. Serum biochemical parameters were determined using the biochemistry analyzers ILab 650 and Spotchem EZ SP-4430.

Statistical analysis:

The obtained data were analyzed by using SAS (2000) by applying analysis of t-test independent samples**.**

RESULTS AND DISCUSSION

Growth performance:

Individual body weight of ram lambs under the study Table (2) showed that, Romanov and crossbred ram lambs (E X R) grown well and gained satisfactory weight in the first and second growing period of the experiment.

Body weight gain was significantly higher in crossbred (E × R) lambs in the first and the second periods of the experiment (19.03 and11.15 kg) compared to Romanov lambs (14.50 and8.26 kg) for purebred respectively.

At the same time results revealed significant advantage of crossbred (E × R) lambs over Romanov lambs in average daily gain in both first and second periods of the experiment (212 vs. 161 g and 186 vs. 138 g, respectively).

The increase in body weight at 6 m age for (E × R) crossbred was 4.78 kg or 11.3% heavier than Romanov lambs. At 8 m age the superiority of crossbred (E × R) body weight was 7.67kg or 15.2 % more than Romanov lambs. Differences were significant ($P \leq 0.05$) in both times.

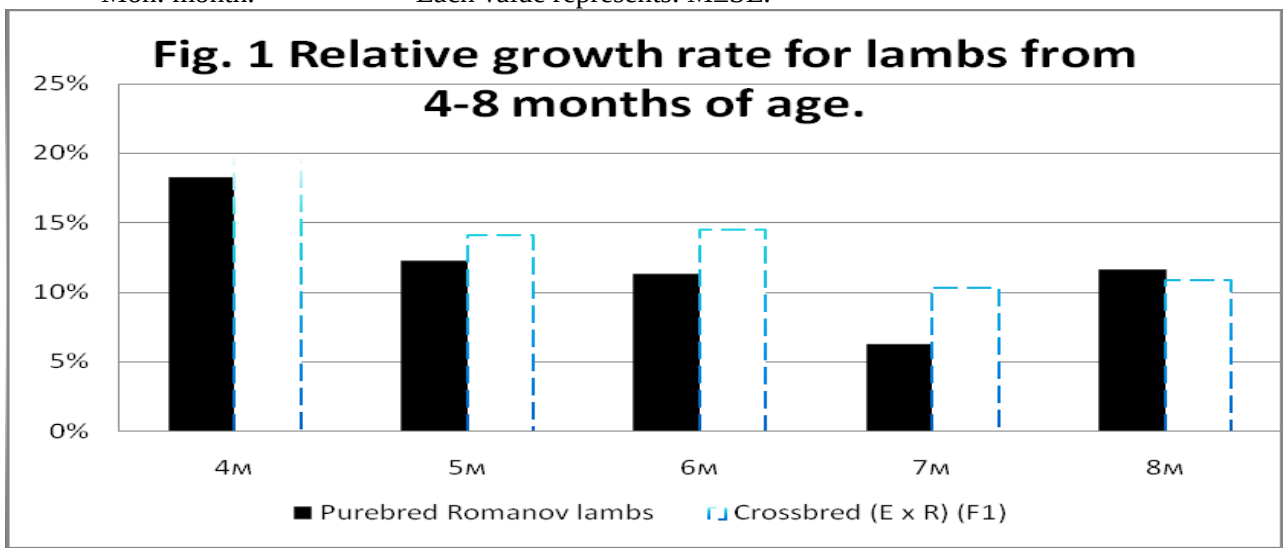
Relative growth rate:

Relative growth rate consider an important indicator for evaluation of growth performance lambs. Results are presented in figure (1).

Table 2. Body weight (kg) and average daily gain (g) of lambs from 3 to 8 months of ages.

Group	Body weight, (kg)			Average daily gain, (g)	
	3mon.	6mon.	8mon.	3 - 6mon.	6 – 8mon.
Romanov lambs	27.67±0.31	42.17±1.25	50.43±1.20	161	138
F1 Crossbred (E x R)	27.92±1.08	46.95±1.63*	58.10±1.76*	212*	186*

Means in the same columns within the same classification with star (*) are significantly different (P≤ 0.05).
Mon: month. Each value represents: M±SE.



M: month

The superiority of E × R crossbred during the entire periods of the experiment was observed. At the same time, the relative growth rate showed regular decrease in intensity of growth lambs with ageing from 4 to 7 months. The differences in this indicator were significant at ages 4, 6 and 8 months (P ≤ 0.05).

The present results come in agreement with those obtained by **Momani *et al*. (2010), Burke *et al*. (2002), Karaoglu *et al*. (2002),** who reported that growth performance parameters (body weight and average daily gain (ADG) and relative growth rate) are significantly differ among genotypes of sheep and that the desirable crossbreeding effects might be due to heterosis and breed complementarity.

Digestibility coefficient of nutrients:

Nutritive value of feeds is determined by a number of factors, including composition, odor, texture and taste. These factors are generally measurable in case of the animal as digestibility and feed intake. Digestibility usually provides a fairly reliable index of nutritive value because more digestible feeds are normally consumed to a greater extent than less digestible feeds, **(Schneider and Flatt, 1975).**

Results in Table (3) show that the digestibility of nutrients in the first and second periods of growth were generally higher in crossbred lambs (E x R) compared with Romanov except for the crude fat in the 2nd period.

The increase was significant only in first growing period from 3 to 6 months of age in crude protein and fiber. The obtained results are in harmony with that detected by **Wildeus *et al*. (2006)** who recorded breed differences between three hair sheep breeds (Barbados Blackbelly, Katahdin, and St. Croix) in digestibility and absorption of nutrients especially nitrogen.

Carcass evaluation:

Carcass evaluation was done at the end of the experiment by controlled slaughtering of three lambs from every group. Measures of controlled slaughtering and carcass deboning are presented in Table (4).

Table 3. Digestibility coefficients of nutrients composing ration of lambs

Group	DM	OM	CP	EE	CF	NFE
5 months						
Romanov lambs	68.99±10.90	70.78±10.05	65.07±1.96	68.43±1.58	65.18±2.54	72.15±8.04
F1 Crossbreed E x R	71.69±3.04	73.71±1.85	69.11±0.53*	72.97±2.81	70.64±6.60*	75.31±5.14
7 months						
Romanov lambs	78.62±1.84	80.56±2.04	76.32±3.24	89.28±0.64	59.96±2.0	83.68±2.03
F1 Crossbreed E x R	79.21±1.04	81.09±2.44	78.48±4.46	85.41±0.90	60.29±1.5	85.20±1.45

Means in the same columns within the same classification with star (*) are significantly different (P≤ 0.05).
Each value represents: M±SE.

Table 4. Controlled slaughtering and carcasses deboning parameters

Parameter	Romanov lambs	F1 Crossbred (E x R)
Final BW	50.27±1.50	58.20±1.03
Pre-slaughter weight	48.80±1.68	56.77 ±0.99*
Pair carcass weight	23.90±1.02	28.33±0.94*
Visceral fat mass	1.10±0.06	1.60±0.2
Slaughter weight	25.00±1.04	29.83±0.92*
Dressing percent %	51.20±0.47	52.62±0.79
Results deboned carcasses		
Cold carcass wt., kg	23.10±1.06	27.77±1.04*
Longissimus muscle, kg	1.16±0.02	1.42±0.06
Mass of flesh-meat, kg	14.45±0.83	17.33±0.48
Carcass fat mass, kg	3.48±0.29	4.33±0.44
Carcass bone mass, kg	3.96±0.11	4.30±0.11
Ratio of other tissues, kg	0.34±0.02	0.28±0.04
Ratio of bone to the weight of the carcass%	17.14	15.48
The ratio of flesh to the bones	3.65±0.28	4.03±0.14

Means in the same columns within the same classification with star (*) are significantly different (P≤ 0.05).
Each value represents: M±SE.

The fore mentioned results in table (4) show advantage of crossbred lambs (E x R) in all indicators of controlled slaughter and results deboned carcass. Pre-slaughter weight, pair carcass weight (doubles), slaughter weight and cold carcass weight revealed significant differences (P ≤ 0. 05) between the two groups while visceral mass fat and carcass fat mass showed no significant difference.

The weight loss in the mass of carcass during the period of cooling was higher with Romanov lambs than crossbred lambs (E X R), being 800 g and 560 g respectively. Dressing percentage based on the warm carcass weight, show also insignificant difference between crossbred lambs (E X R) and Romanov lambs.

The most important factors of carcass values are meatiness and fatness. Carcass of crossbred lambs (E X R) contains 20% more muscle tissue and 24.4% intramuscular fat with almost the same content of bones, than Romanov carcasses. As a result, the coefficient of meatiness (ratio of flesh to bone) was more by 10.4%. These results run with those published by **Momani *et al.* (2002)** and **Pajor *et al.* (2009)** who demonstrated that F1 crossbreeds Awassi × Romanov and F1 crossbreds Awassi × Charollais were superior to Awassi ram lambs in carcass traits and carcass composition.

Serum biochemical parameters:

All measured serum blood parameters were within the normal physiological range. Serum biochemical parameters of lambs are presented in table (5).

Concentrations of aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase were slightly but not significant higher in crossbred lambs than Romanov lambs. This indicates an increased metabolism in their body, that expressed by higher daily gain in body weight compared to Romanov lambs.

At the same time, urea level in the blood of crossbred lambs was lower by 0.5Mmol / L or 10.9% compared with the purebred Romanov lambs. This indicates a more efficient use of nitrogen of feed. The level of glucose in crossbred lambs was significantly more (+ 0.6 Mmol / L) than Romanov lambs.

However, generally no significant difference between the two groups in most serum parameters. The results in the present study are consistent with that recorded by **El-Ashry, *et al*. (2001)**, **Saleh, *et al*. (2006) and Fathalla, *et al*. (2012)** who reported no significant differences between genotypes of sheep in the serum biochemical blood parameters except for AST, ALT and glucose levels.

In the same time, the significant difference in level of glucose between the two groups come also in accordance with results obtained by **El-Barody, *et al.* (2002) and Fathalla, *et al*. (2012)** who recorded significant difference among sheep genotypes (Romanov lambs and crossbred lambs Tsigai X Romanov) under study in the level of glucose in blood.

CONCLUSION

The dynamics of growth; body weight, average daily gain and relative growth rate and the results of controlled slaughter give preference to the crossbred lambs (E X R) than Romanov dams. However, this crossbred lambs deserve further investigations to decide either using it as crossbreeding commercial line or as start for developing new genotype.

ACKNOWLEDGEMENT

The authors gratefully acknowledge all members of the Department of Breeding and Nutrition in All-Union Scientific Research Institute of Animals (VIZH), Moscow, Russia for their support during the period of carrying out the research.

Table 5. Serum biochemical parameters of lambs at age 7 months.

indicator	Group	
	Romanov lambs	F1 Crossbred (E x R) lambs
	Age, months	
	7mon.	
Total protein, g/L	**64±1.5**	**64.7±0.7**
Albumin, g/L	**35±0.6**	**34.7±0.3**
Globulin, g/L	**29±1.1**	**30±0.6**
Urea, mmol/L	**4.6±0.41**	**4.1±0.42**
Creatinine, mmol/L	**58.7±3.7**	**54±3.2**
AST, µ/L	**74±5.03**	**88.3±4.1**
ALT, µ/L	**15.3±2.7**	**16±1.73**
Alkaline phosphatase, µ/L	**228±30.73**	**247.7±13.6**
Triglycerides, mmol/L	**0.21±0.04**	**0.17±0.02**
Glucose, mmol/L	**4.1±0.21**	**4.7±0.06***

Means in the same columns within the same classification with star (*) are significantly different ($P \leq 0.05$).
Mon: month. Each value represents: M±SE.

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