THE ROLE OF CROSSBREEDING ROMANOV SHEEP WITH SUBTROPICAL RAHMANI BREED IN IMPROVING LAMB PRODUCTION EFFICIENCY

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ABSTRACT

The performance of pure Romanov (V), Rahmani (R) sheep, F1 crosses (V.R), back crosses to R (R.VR) and cross-bred sheep obtained by inter se mated (R.VR)' was compared. Romanov ewes were mated once yearly, but R and V crosses were mated each 8 months.

Romanov ewes gave birth to 2.31 lambs/ewe with conception rate averaging 79.7%,but their high lamb losses markedly reduced number of lambs weaned. Crossbred ewes had higher (P<0.01) fertility, greater (P<0.01) prolificacy and lower (P<0.01) lamb weaning weight than R ewes. Superiority of crossbred ewes over R ewes ranged from 6.63 to 9.36 % in fertility and from 0.22 to 0.43 lamb in prolificacy. Breed groups did not differ significantly in pre -weaning survival rates.

The R.V ewes averaged 0.43 more lamb per litter than did R and 0.18 more lamb per litter than R.VR ewes. Inter -se mating of the R.VR did not affect the prolificacy of the produced ewes.

The V.R ewes gave birth to 1.1 more lambs (3.9 vs. 2.8), weaned 0.9 more lamb (3.3 vs. 2.4) and 6 kilograms more of lamb (37.8 vs. 31.8) than did R ewes, over two year duration. While, R.VR ewes had 0.5 more lamb born and 0.3 more lamb weaned than did R ewes. On the other hand, R and R.VR ewes had similar weights of lambs weaned.

The results indicated that V.R ewes were 15% more efficient than R.VR ewes and 22% more efficient than R ewes.

Keywords: Romanov, crossbreeding, lamb production, ewe efficiency.

INTRODUCTION

An increase in the number of lambs marketed per ewe per year offers an important tool for increasing the efficiency of lamb meat production (Shelton, 1971). One way of achieving this is to increase the genetic potential of sheep flocks. The use of the crossbreeding program to combine the adaptability of subtropical breeds with the high prolificacy of exotic breed presents a rapid mean for increasing efficiency of lamb production (Terril, 1974). Romanov sheep (V) have been extensively utilized for crossbreeding with a wide range of sheep in several countries to improve prolificacy. In this study, the local Rahmani and its crosses with V were evaluated according to ewes and lambs production traits. Ewe body weights, total weight of weaned lamb over three successive breeding seasons, and index combining these traits were also considered for each breed group of ewe.

MATERIALS AND METHODS

Data collected over 8 years (1990 to 1997) from Experimental Stations of the Ministry of Agriculture were included in the analysis.

The breeding plan was to crossbreed Romanov (V) rams with Rahmani

(R) ewes to produce (V.R), which were used to produce reciprocal back crosses (R.VR).The breed group (R.VR) was inter se mated to produce (R.VR).Data included records of 1845 ewes' exposures,1456 parturition's and 1970 lambs born.

Ewes were first exposed to rams at an average age of 18 months. They were bred to lamb every 8 months (three times in 24 months). They were exposed to rams for approximately 40 days in January, May and September and therefor lambed in May, October and February. Romanov ewes were bred once per year, as being seasonal breed, in which breeding season extended from September to October. Rams that lacked libido during breeding were replaced with reserve rams.

Sheep were fed according to a local feeding standards assigned by APRI, MOA which represent 85% of the NRC allowances (MOA, 1968). The practice of feeding made all genotypes received the same feeding level over the breeding season. All lambs suckled naturally until weaning at two months age. Ewes were cancelled from the study if they failed to lamb in 2 consecutive years.

The GLM procedure of SAS (1987) was used to perform all analysis. Lamb-production traits analyzed in this study included ewe fertility (ewes lambing per ewe exposed ,EL/EE),ewe prolificacy(lambs born per ewe lambed, LB/EL), lamb survival(lambs weaned per lamb born, LW/LB) ,and lamb weaning weight adjusted to 60d of age(WEAN-60)***.***The mathematical model for each analysis with appropriate degrees of freedom ,is shown in table1.Sex of lamb was added to the model for analyses of lamb survival and lamb weaning weight. A separate analysis was conducted for Romanov ewe performance in which season was not included in the model.

Ewe age represented the age at the beginning of the lambing season to the nearest whole year. The four age categories of 2,3,4 and 5 through 6 yr of age were used. Years were divided into four cycles of accelerated lambing. Each cycle was made up of three breeding seasons extended over two year's duration.

The measurements of production per cycle were; the total number of lambs born per ewe exposed TLB/CYC, the total number of lambs weaned per ewe exposed, TLW/CYC, and the total weight of weaned lambs per ewe exposed, TKgW/CYC. The measure of ewe efficiency is calculated as the total weight of lambs weaned per ewe exposed per kg of ewe' body weight per production cycle. Main effects in the model included ewe' breed, cycle and age of ewe. All main effects were considered to be fixed. All possible two -way interactions were included in the model. The analysis of lambs' traits showed insignificant effect for sex of lamb on lamb survival, but ram lambs were 0.98 kg heavier (p<0.01) at weaning than ewe lambs. Therefore, for TKgW/CYC, the total 60-d weight was adjusted for sex by subtracting 0.49 kg from ram lambs and adding 0.49 kg to ewe lambs weights. Records were not adjusted for type of birth.

RESULTS AND DISCUSSION

Mean squares and tests of significance for the analyses of variance are presented in table 1. Least squares means for the lamb production traits studied, are presented for each breed group (Table 2).

Cycle. Cycle had a significant effect on all traits except on LW/LB .The effect of cycle on LW/LB agrees with those reported by Bunge *et al*.(1993),and many others who found that there was no significant effect of year on lamb survival***.*** Ewe fertility differed significantly among cycles. Prolificacy (included lambs alive or dead at birth plus abortion) was positively related to change in fertility rate within the cycle (the cycle with the highest EL/EE had the highest LB/EL).

Lambing season. Fertility was better (P <0.01) in September than in May mating season while January had intermediate value. The effect of lambing season on LB/EL, LW/LB were similar. Interactions of cycle with lambing season were significant for EL/EE and LW/LB. The causes of those interactions are not known.

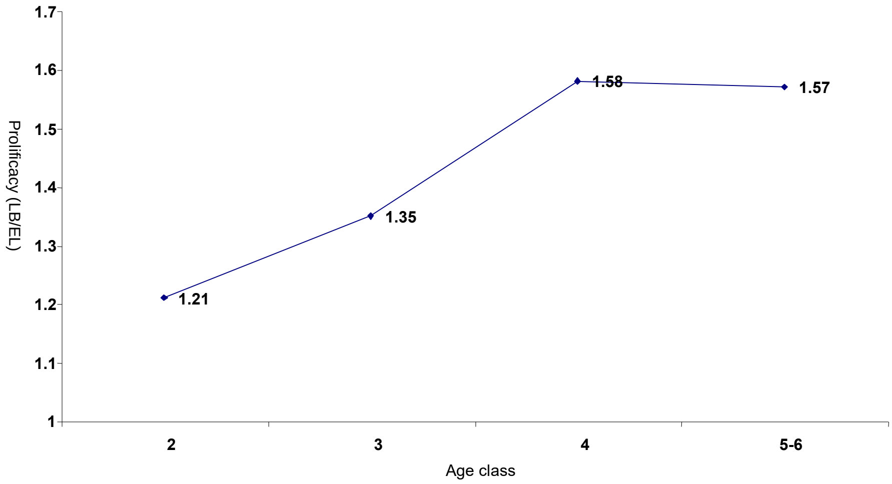
Table 1: Analysis of variance of genetic, environmental and interaction effects on lamb production traits.

Source	d.f	Mean square for:			
		EL/EE	**LB/EL**	**LW/LB**	**WEAN-60**
Breed (B)	3	89.5**	9.0**	6.5	5.3**
Cycle (C)	3	103.6**	0.7*	44.6	16.2**
Lambing season (S)	2	321.6**	1.0*	101.3**	3.4
Ewe age	3	5.6	4.7**	40.8	4.1*
Sex	1	--	--	9.7	16.8**
B *x* S	6	33.6	0.5	25.2	1.6
C *x* S	6	111.1**	0.3	223.1**	1.7
B *x* C	9	125.4**	0.1	63.4**	9.0**
Residual		16.9	0.2	17.5	7.1

LB/EL= Ewes lambed per ewe exposed; LB/EL= Lambs born per ewe lambed; LW/LB= Lambs weaned per lamb born and WEAN-60 = Lamb weaning weight adjusted to 60 d of age. * P< 0.05. ** P< 0.01.
Residual d.f are 1813 for variable one, 1424 for the second variable, 1938 for the third variable and 1072 for the fourth variable.

Ewe age. Prolificacy was significantly increased with age until 4 yr. age while there was a very small difference among ages 4 through 6 (Figure 1).There was no significant effect for ewe age on EL/EE or on LW/LB***.*** Previous work by Busch and Slyter (1985) and Atkins (1986) reported an increase in reproductive performance from young through intermediate ages, a peak at intermediate ages, and a slow decline through older ages. Wilson and Light (1986) reported increased lamb survival with increasing ewe age***.*** Numerous reports have documented age of dam effect on their lambs weaning weight (Stobart *et al*., 1986, as example). Shelton and Menzies (1968) found small differences in litter size for ewes of ages 3 through 7 ,with noticeable lower performance outside this range. The present result did not cover this stage of older ewes due to lack of adequate number of Romanov crossbred ewes over 7 yrs old.

Fig .1 : Changes in prolificacy according to age of



Breed group. All crosses were superior to R in EL/EE, LB/EL with differences ranging, respectively, from 6.63 to 9.36%,and from 0.22 to 0.43 lamb. On the other hand, Rahmani ewes weaned heavier lambs (P<0.01) than Romanov crossbred ewes (13.3 vs. 11.7 kg; Table 2), even though weights were not adjusted for type of birth. As shown in table 2, crossbred ewes had similar fertility rates, but R.V ewes gave birth to 0.18 more lambs per ewe lambed than R.VR ewes. Half Romanov ewes gave 0.43 more lambs per litter than did R ewes, which resulted from an increase in twins (41.16 vs. 15.3 %; Table 3) and triplet (3.96 vs. 0.42%) births. On the other hand, R.VR and (R.VR)' ewes had similar incidents of single (80%) and twins (19%) births. However, the present result indicated that inter -se mating of the backcross did not affect the prolificacy of the produced ewes. The purebred V ewes gave births to 2.31 lambs with conception rate averaged 79.69%, but their high lamb losses markedly reduced number of lambs weaned (Table 4). However, R.V ewes' prolificacy was less than expected from the additive contribution of V genes. Deviations from the expected means were higher in the F1 than in the backcross. Discrepancy from expectation in litter size at birth may be due to possible early embryonic mortality of high fecundity ewes under prevailing subtropical conditions (Aboul-Ela *et al*., 1988). However, Gallivan *et al*. (1993) reported the superiority of V crosses for embryonic survival than Finn crosses. On the other hand, the results of fertility may indicate positive heterosis in the breeding activity of V crossbred ewes, supporting findings of other crosses between Finn and several temperate breeds (Hanrahan, 1987; Aboul-Naga *et al*., 1989).

Table (2): Least –squares means of lamb production traits of Rahmani (R) and its crosses with Romanov (V) under accelerated lambing system.

Traits	Genotype			
	R	V.R	R.VR	(R.VR)1
Fertility, %	68.67±1.7[b]	78.03±1.98[a]	76.09±1.99[a]	75.3±7.28[a]
Prolificacy, N	1.20±0.02[c]	1.63±0.02[a]	1.45±0.04[b]	1.42±0.03[b]
Lambs survival. %	86.36±3.88[a]	85.56±2.8[a]	84.58±2.71[a]	82.63±2.7[a]
Lambs weaning wt., kg	13.26±0.32[a]	11.63±0.24[b]	11.72±0.25[b]	11.69±0.25[b]

Means within traits with the same letter are not significantly different.

Table 3: Incidence of multiple births in different breed groups.

Breed group	Single (%)	Twin (%)	Triplet (%)	quadruplet (%)
R	84.28	15.3	0.42	----
V.R	54.79	41.16	3.96	0.11
R.VR	79.82	18.92	1.26	----
(R.VR)	80.49	18.70	0.81	------

In the same flock base, Elshennawy *et al*. (1998) found a 9 and 37% higher litter size for 1/4 Finn and 1/2 Finn crossbred ewes compared to Rahmani ewes. The present corresponding findings (25 and 43%, respectively) support the superiority of Romanov crosses for prolificacy. The superior prolificacy of Romanov vs. Finn crosses are in agreement with findings of other studies. In Spain, Valls Ortiz *et al*. (1976; cited by Jackubec,1977) reported ovulation rates of 1.73 and 1.6 for Romanov x Rasa Aragonesa and Finnish Landrace x Rasa Aragonesa crossbred ewes, respectively. Vesely and Swierstra (1986) reported that Romanov additive genetic effects for ovulation rate and litter size were higher than those of Finnish Landrace. Superior litter sizes have also been reported for Romanov vs Finnish Landrace crosses with muttton Merino (Jakubec, 1977) and with DLS (Fahmy, 1990). Gallivan *et al.* (1993) found that Romanov x Targhee crossbred ewes gave birth to 0.42 more ($P< 0.01$) lambs per ewe lambing, had 0**.**39 more ($p<.01$) lambs alive at weaning per ewe lambing than Finnish Landrace x Targhee crossbred ewes. This superior prolificacy resulted from an increase in triplet births. Gabina and Valls Ortiz (1985) concluded that Romanov x Rosa Aragonesa ewes were superior to Finnish Landrace x Rasa Aragonesa ewes by 5 to 15% for all reproductive traits measured.

Table 4:Reproductive performance of purebred Romanov under one crop per year management system.

Ewe body wt. (Kg)	EL/EE (%)	LB/EL (N)	LW/EL (N)	KgW/EL (Kg)
44.05 ± 0.39	79.69 ± 3.3	2.31± 0.07	1.62± 0.09	15.36 ± 1.10

LW/EL=Lambs weaned per ewe lambed and KgW/EL= Litter weight at weaning per ewe lambed. EL/EE and LB/EL as those outlined in footnote of Table (1).

There was no significant effect of breed of ewe on lamb's survival. In contrast to this result, Smith (1977), Cochran *et al*.(1984) and Elshennawy *et al*. (1998) found that non-prolific indigenous pure breeds exhibited higher preweaning survival rates than Finnsheep crosses. Also, this finding suggests superior adaptability of Romanov crosses over Finn-crosses to the prevailing subtropical environment. Although the survival of purebred Romanov lambs has usually been reported to be superior to that of purebred Finnish Landrace lambs (e.g., Ricrodeau *et al*., 1990 in the same flock), Gabina *et al*. (1983) found equal survival for the two breeds. Fahmy (1990) reported similar survival rates for offspring of Romanov and Finnish Landrace crosses, with and without adjustment for litter size, with DLS breed and Galliven *et al*. (1993) with Targhee breed.

Production based on the whole cycle , V.R ewes gave births to 1.1 more lambs (3.9 vs. 2.8;Table 5), weaned 0.9 more lambs (3.3 vs 2.4) and 6.0 kg more lamb weight (37.8 vs. 31.8 kg) than did R ewes. While, R.VR ewes had 0.5 more lamb born and 0.3 more lamb weaned than R ewes. On the other hand, R and R.VR ewes had a similar weights of lambs weaned. Ewe efficiency estimates (Table 5) were higher among V.R (0.92 kg) than for R.VR (0.78 kg) and R ewes (0.72 kg)**.**The efficiency was estimated relative to the V.R ewes. Therefore, V.R ewes were 15% more efficient than R.VR ewes and 22% more efficient than R ewes.

Breed x Environment Interactions. None of the breed x season interactions were significant. Breed interacted significantly with cycle for EL/EE, LW/LB and for lamb weaning weight.

Table 5: Least squares means and standard errors of ewe body weight, total lamb production and ewe efficiency during the production cycle of each genotype.

Genotype	EB wt [a], kg	Average production of cycle [b]				
		TLB, N	TLW, N	TL wt, kg	Relative efficiency [c]	Efficiency, %
R	44.6±.3 [a]	2.8±.06 [c]	2.4±.06 [c]	31.8±.81 [b]	0.72±.02 [b]	78
V.R	41.4±.3 [b]	3.9±.07 [a]	3.3±.06 [a]	37.8±.95 [a]	0.92±.02 [a]	100
R.VR	41.4±.3 [b]	3.3±.09 [b]	2.7±.09 [b]	31.9±1.2 [b]	0.78±.03 [b]	85
(R.VR)[1]	41.4±.5 [b]	3.3+.10 [b]	2.7±.11 [b]	31.0±1.5 [b]	0.76±.04 [b]	83

a Body weight at rebreeding time.
b Average production of the three successive breeding seasons / 2 years.
TLB Total number of lambs born per ewe exposed.
TLW Total number of lambs weaned per ewe exposed.
TL wt Total weight of lambs weaned per ewe exposed.
C Total weight of lambs weaned per ewe exposed/ewe body weight.
Means within a column with the same symbol are not significantly different.

Implications. The results of this study demonstrated the superiority of the V.R over the Rahmani purebred. Half -Romanov ewes showed higher fertility rates , gave birth to more lambs, and weaned more weight of lamb than did Rahmani ewes without any sacrifice in the lamb survival of the F1 lambs. These data could indicate that for every 100 R ewes brought into the breeding flock, 720 lambs weaned and 9540 kg of weaned lamb were produced within three production cycles (6 yr.), whereas for every 100 V.R ewes, 990 lambs weaned and 11340 kg weaned lamb were produced. Among R.VR groups, The corresponding estimates were 810 lambs and 9570 kg, respectively. Because of the higher value of lamb compared with kg weaned, R.VR ewes had a higher gross return than R ewes during their lifetime. However profitability can be increased in system in which the management can be altered to allow more of extra lambs to be reared by the ewes.

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تأثير خلط أغنام الرومانوف مع الرحمانى على كفاءة إنتاج الحملان

حلمى رشاد مطاوع
قسم بحوث الأغنام والماعز- معهد بحوث الإنتاج الحيوانى-الدقى

أجريت هذه الدراسة لتقييم أثر خلط الأغنام الرحمانى مع الرومانوف على الكفاءة الإنتاجية للأغنام.

أظهر خليط الرومانوف تميزاً على أغنام الرحمانى بمقدار يتراوح من 6.53-9.36% فى نسبة الخصوبة ومن 0.22-0.43 فى عدد الحملان المولودة. ولم يكن هنااك تأثير سلبى على معدل الحياتية للهجن مقارنة بالحملان المحلية من الميلاد حتى شهرين.

ولقد أظهرت مقاييس الكفاءة البيولوجية أن خليط 2/1 رومانوف أكثر كفاءة من خليط 4/1 رومانوف بمعدل 15 % كما كان أكثر بمقدار 22% كفاءة من نعاج الرحمانى.