

EFFECT OF BREED, AGE AND FOOD ON REPRODUCTIVE EFFICIENCY OF FEMALE SHEEP OF THE TSGAI - RUSTY VARIETY PUREBREED AND THEIR CROSS WITH THE SUFFOLK AND GERMAN BLACKFACE

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Abstract

Fertility, prolificacy and weaning rate were compared for Tsigai - rusty variety (TIRU) purebreed ewes and their Suffolk (50%) × German Blackface (37.5%) x Tsigai - rusty variety (12.5%) (S x BF x TIRU) contemporaries, mated at 8 and 18 months of age. The fecundity, prolificacy and weaning rate for animals mated at 8 months of age and fed in the shelter with hay and corn-barley based concentrate was 78.43%, 105.0% and 78.57% to females from TIRU and 80.0%, 100.0% and 54.17% for animals of the S x BF x TIRU genotype, respectively. For animals of the two breeds mated at 18 months of age and grazing on pastures, the fecundity, prolificacy and weaning rate was 64.71%, 100.0% and 87.88% to females from TIRU and 73.33%, 104.55% and 78.26% for animals of the S x BF x TIRU genotype, respectively. 88.24% females from TIRU and 90.0% from S x BF x TIRU genotype, mated at 8 months, have lambed once up to age of 23-24 months, and 56.86% females from TIRU and 56.66% from the animals from S x BF x TIRU genotype have lambed twice.

Key words: early bred, efficiency, genotype, reproduction, Tsigai - rusty variety.

INTRODUCTION

The Tsigai breed is a sheep breed raised for milk, meat and wool production, the breeding area being the regions of Central, Eastern and Southern Europe (Cinkulov et al., 2008).

In Romania, the Tsigai sheep is the second most important breed, the main productions for which it is raised are milk and meat, as the interest in wool production has lost its importance due to the low price obtained for wool sales (Ilișiu et al., 2013).

Due to the increasing of the lack of labor in the sheep breeding sector in recent years, many sheep breeders are focusing on improving meat production. The methods used to increase meat production within a race are multiple, but feeding technologies on the one hand and improvement of reproductive performances of sheep on the other hand, are key factors that can contribute to improving of meat production.

As stated by Gavojdian et al. (2015), fertility related traits and lambs weaning rates represent

the main indicators for profitability, when meat sheep are concerned.

From the point of view of the sheep breeders, the profitability of farms can be improved by introducing young females at the age of 12-14 months to reproduction. Mating young females of sheep to lamb first time at 17-19 months compared to sheep lambing at 24 months for the first time, can contribute to improving flock profitability.

By introducing the young female to reproduction a few months earlier than usual, the sheep breeders can manage better the sheep flock, find out earlier information about the reproductive traits of the females, being able to eliminate infertile females from reproduction.

As stated by Hutchison et al. (2022), the differences of reproductive rate between young female and mature ewes are by 50%. The reproductive performances of young females can be influenced by genotype. Fogarty et al. (2007) suggest that age and body weight at first mating are attribute which influences ewe lamb reproductive performance.

Within a breed or genotype, the body weight is probably the most important factor on reproductive performances of young sheep. Some authors mentions the existence of positive correlations between the body weight of young sheep at first mating and their reproductive characteristics (Kenyon et al., 2014; Paganoni et al., 2014; Edwards et al., 2017; Nieto et al., 2019; Shorten et al., 2021; Thompson et al., 2021; Haslin et al., 2022).

The aim of current study is to determine the effect of breed, age and food on reproductive performances of Tsigai breed - rusty variety and their cross with Suffolk and German Blackface.

MATERIALS AND METHODS

Animals and location

The two experiments described here were carried out using ewe lambs 8 months of age and 18 months-old ewes of the Tsigai - rusty variety purebred (TIRU) and their Suffolk (50%) x German Blackface (37.5%) x Tsigai - rusty variety (12.5%) (S x BF x TIRU) contemporaries. The experiments were conducted in the Experimental Base Reghin of Research Institute for Sheep and Goat Palas Constanta, Mures County, 46°46' N/ 22°42'E; 395 m altitude; annual rain fall varies between 650-700 mm; average temperatures 19/-3°C during summer/winter). Reproductive performances during early breeding and at 18 months of age were observed over 2 years on female sheep born January-March 2020. A total of 51 ewe lambs of TIRU breed and 30 ewe lambs of S x BF x TIRU genotype were included. Up to 16 months, all sheep were raised in the shelter. After this time, the sheep grazed on pastures until beginning of December. Starting on the 1st October in the first year (8 to 9 months age) and 1st of August of the 2nd year (18-19 months age) and for a mating period of 45 days, females of the two breeds, were mated with rams of the TIRU sheep breed and S x BF x TIRU genotype, respectively. In the 1st year, after mating, all females were fed with 1.5 kg hay and 0.50 kg corn-barley concentrate (50%-50%) (14% crude protein content) per head per day during first 3 months of pregnancy and with 2.0 kg hay and 0.8 kg corn-barley concentrate (50%-50%) in

late pregnancy and early lactation. The age in days, live weight at mating and at lambing, the incidence of lambing and the number of lambs born were recorded.

For mating at 18 months of age, the two groups of animals used in the early breeding experiment were available. In total, fifty-one and thirty sheep of respectively TIRU breed and the S x BF x TIRU genotype were used and data on both groups and both mating ages are presented here. Starting on May 15th and until August 15th, animals of the two breeds were grazed on pasture in the same flock. In mid-August, the animals were separated in two flocks and were grazed on pastures, and were organized controlled mating with rams from TIRU breed and S x BF x TIRU genotype, respectively. In mating period (45 days), the food was supplemented for each flock with 0.3 kg corn-barley-based concentrate (14% crude protein content)/head/day. In late pregnancy (December-Januar) all sheep were fed per head per day with 1.5 kg hay and 0.5 kg corn-barley-based concentrate and in early lactation with 2.0 kg hay and 0.8 kg corn-barley-based concentrate. Live weight at mating, the incidence of lambing and the number of lambs born were recorded.

In order to determine the effect of breed, age and food on reproductive efficiency of female sheep of the Tsigai - rusty variety purebreed and their cross with the Suffolk and German Blackface, the mean comparisons between the two groups of the variables were carried out using independent samples Student t-test of the JASP procedure.

RESULTS AND DISCUSSIONS

This experiment investigated the effect of breed, age and food on breeding performances of young females mated at 8 months of age and mature ewes (mated at 18 months age), and performances of their progeny.

Table 1 shows overall values and differences between the two breeds structures (TIRU and S x BF x TIRU) in body weight at mating, age at mating, the number of sheep lambing and mean litter size of young females mated at an early age.

Table 1. Reproduction indices for females mated at 8 months of ages

Specification	TIRU	S x BF x TIRU	Overall
Number of sheep joined (head)	51	30	81
Body weight of sheep at mating (kg)	40.62 ± 0.61 ^A	52.65 ± 1.21 ^B	45.08 ± 0.87
Age (days)	234.92 ± 1.28	240.60 ± 1.65	237.03 ± 1.05
Body weight of sheep at birth (kg)	51.77 ± 0.76 ^A	64.73 ± 1.18 ^B	56.57 ± 0.95
Number of sheep lambing (head)	40.0	24.0	64.0
Number of lambs obtained (head)	42.0	24.0	66.0
Number of lambs weaned (head)	33.0	13.0	46.0
Fecundity (%)	78.43	80.0	79.01
Prolificacy (%)	105.0	100.0	103.13
Weaning rate (%)	78.57 ^a	54.17 ^b	69.70

^{a, b} - Means in the same line with different superscripts are significantly different (p<0.5);

^{A, B} - Means in the same line with different superscripts are significantly different (p<0.001).

With regard at live weight at mating, between the two groups of young females mated at 8 months were recorded significant differences (p<0.001) in favour of S x BF x TIRU. Ewe lambs from Tsigai breed had at 8 months an average body weight lower by 29.61% than their contemporaries S x BF x TIRU, but the fecundity was not affected by this difference in body weight (p>0.05).

Significant difference (p<0.5) is observed on the weaning rate of lambs from the two genotype, which is higher with 26.87% to Tsigai breed.

The average live weight of the whole flock at breeding was 45.08 kg at 8 months (Table 1) and 43.40 kg at 18 months (Table 2).

Some authors (Moore et al., 1978; Meyer & French, 1979; Craig, 1982; McMillan & Moore, 1983), have shown, that increasing body weight at the beginning of the mating period has led to the increase of mating activity.

Concerning reproductive performances of ewes mating at 18 months of age, data on the reproduction indices are shown in Table 2. For the 2nd mating, the average body weight at breeding for ewes lambs from Tsigai breed was

close to the one at 8 months (-0.34 kg), and that of the S x BF x TIRU was lower than the one at 8 months with 7.48% (-3.94 kg). It should be mentioned that before the 1st lambing and until the lambs were weaned, the sheep were kept in the stable and fed with concentrates and hill hay, and after, until the beginning of the 2nd mating, the sheep grazed on pasture of medium quality, whose floristic composition is constituted by 90% of grasses from the spontaneous flora (in which the proportion of *Deschampsia cespitosa* is over 50%, together with *Festuca pratensis*, *Dactylis glomerata* and *Lolium perenne*) and 10% legumes (*Trifolium repens*).

Table 2. Reproduction indices for females mated at 18 months of ages

Specification	TIRU	S x BF x TIRU	Overall
Number of sheep joined (head)	51	30	81
Body weight at mating (kg)	40.28 ± 0.73 ^A	48.71 ± 1.17 ^B	43.40 ± 0.78
Age (days)	528.92 ± 1.28	534.60 ± 1.65	531.03 ± 1.05
Number of sheep lambing (head)	33.0	22.0	55.0
Number of lambs obtained (head)	33.0	23.0	56.0
Number of lambs weaned (head)	29.0	18.0	47.0
Fecundity (%)	64.71	73.33	67.90
Prolificacy (%)	100.00	104.55	101.82
Weaning rate (%)	87.88	78.26	83.93

^{A, B} - Means in the same line with different superscripts are significantly different (p<0.001).

The fecundity of ewes at 18 months was lower than at 8 months for both breed structures. For Tsigai breed, although the average body weight at 18 months was lower with 0.83% than to the one at 8 months, the fertility was lower with 13.72%. The conception rates for the Tsigai mature ewes were lower than those, obtained by Gavojdian et al. (2015), for the breed. On the other hand, the average body weight at 18 months was lower with 7.48% to S x BF x TIRU compared to 8 months, and the fertility rate was lower with 6.7%.

The average fecundity rate for the whole flock was lower at 18 months with 11.11% than at 8 months, while the weaning rate of the whole flock at 18 months was 83.93%, higher with 20.29% than at 8 months.

This lower fertility of 64.71% for the group of Tsigai breed and 73.33% for the group of females S x BF x TIRU, for sheep mated at 18 months of age, (lambd for first time at 13-14 months of age and suckled their lambs for at least a two months following early breeding) is with apparently detrimental effects.

When compared the two breed structures, the weaning rate were lower at 8 and 18 months for ewe lambs and mature ewes from S x BF x TIRU (54.17% and 78.26%, respectively) compared to their contemporaries from Tsigai breed (78.4% and 87.88%, respectively). On the other hand, when compared the weaning rate between the two age categories (8 and 18 months), it is observed that the effects of age at breeding on weaning rate is significant ($p < 0.05$) to adult ewes compared to ewe lambs. This is probably due an improved milk production of ewes at 18 months, but we consider that here are more studies needed to highlight the effect of age at first mating on weaning rates of lambs.

Table 3. Reproduction indices for females mated at 8 and 18 months of ages

Specification	8 months age	18 months age
Number of sheep joined (head)	81	81
Body weight at mating (kg)	45.08 ± 0.87 ^a	43.40 ± 0.78 ^b
Age (days)	237.03 ± 1.05	531.03 ± 1.05
Number of sheep lambing (head)	64.0	55.0
Number of lambs obtained (head)	66.0	56.0
Number of lambs weaned (head)	46.0	47.0
Fecundity (%)	79.01	67.90
Prolificacy (%)	103.13	101.82
Weaning rate (%)	69.70 ^a	83.93 ^b

^{a, b} - Means in the same line with different superscripts are significantly different ($p < 0.5$).

The Table 4 highlights the fact that, up to the age of 24 months, 88.24% of the sheep from the Tsigai breed and 90% of the S x BF x TIRU crossbred sheep lambd at least once, while the share for the sheep lambd twice is almost identical for the two breed structures (56.86% at Tsigai breed vs. 56.66% at S x BF x TIRU).

Table 4. The number of sheep that lambd up to 24 months age

Specification	TIRU	S x BF x TIRU	Overall
Number of sheep joined (head)	51	30	81
Lambd once (no.) (%)	45.0 (88.24)	27.0 (90.0)	72.0 (88.89)
Lambd twice (no.) (%)	29.0 (56.86)	17.0 (56.66)	46.0 (46.79)

In mature ewes, the body weight of the ewe at the time of mating is lower at 18 months than to 8 months of age, and negatively associated with the lamb birth weight, lamb weight at weaning and average daily gain from birth to weaning (Table 5). In the present experiment, the body weight of females at mating influence lamb birth weight, lamb weight at weaning and average daily gain. The obtained results of the reproductive performances of young females compared to mature ewes highlight the fact that the performance of young ewes can contribute to improving the profitability of sheep farming.

Table 5. The body weight evolution of lambs from birth up to weaning in the years 2021-2022

Specification	N	TIRU	N	S x BF x TIRU
Year 2021 (lambs from 8 months ewes lambs)				
Weight at birth (kg)	33	3.78 ± 0.10 ^A	13	4.48 ± 0.15 ^B
Weight at weaning (kg)	33	18.32 ± 0.63 ^c	13	22.29 ± 1.67 ^d
ADG g/day	33	196.43 ± 7.64	13	219.40 ± 19.12
Age at weaning (days)	33	73.97 ± 1.42 ^a	13	80.62 ± 2.54 ^b
Year 2022 (lambs from 18 months ewes)				
Weight at birth (kg)	29	3.70 ± 0.01 ^c	18	4.34 ± 0.21 ^d
Weight at weaning (kg)	29	14.03 ± 0.38 ^A	18	17.25 ± 0.60 ^B
ADG g/day	29	139.48 ± 6.94 ^A	18	213.27 ± 15.74 ^B
Age at weaning (days)	29	76.86 ± 2.72	18	78.67 ± 19.78

^{a, b} - Means in the same line with different superscripts are significantly different ($p < 0.5$);

^{c, d} - Means in the same line with different superscripts are significantly different ($p < 0.01$);

^{A, B} - Means in the same line with different superscripts are significantly different ($p < 0.001$).

CONCLUSIONS

The present study highlighted that mating young females of sheep at early age can contribute to improving ewe performance throughout the productive life. The genotype, age, body weight of the young females at first mating and nutrition during gestation period can significantly influence ewe and lamb performance to weaning, as well as ewe reproductive performances. Under Romanian condition, there are a little amount of researches on the productive and reproductive performances of females introduced early for reproduction, therefore further research are needed to help the improvement of farm management.

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