Reproductive Activity of Tsigaie Sheep Belonging to the Hill and Mountain Ecotypes

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Abstract
The reproductive value of sheep belonging to the hill and mountain ecotypes of the Tsigaie breed was characterized based on the analysis of specific indexes. This operation was deemed necessary given our interest in the ex situ conservation of these ecotypes. Our research resulted in establishing that the hill ecotype is superior to the mountain ecotype, as is apparent by comparing indices for the two. The number of sheep in oestrus is higher by 9.56%, the pregnancy rate by 9.14%, the insemination index by 37.11%, the index of abortions by 6.96%, the fertility index by 19.76%, the sterility index by 14.18% and the number of lambed sheep by 15.06%. Only the prolificacy index is higher in the mountain ecotype by 5.96%. This situation stems from the particular biology of each ecotype and warrants optimal keeping and feeding for the mountain ecotype so that future research will not negatively influenced.

Keywords: ecotypes, reproductive indices, Tsigaie

1. Introduction

Romanian animal breeds are the result of a process selection and adaptation of the fittest to a certain environment. Although they are essential to implementing sustainable animal husbandry and food safety, they are presently at risk of disappearing. This trend can be seen in all domesticated species and has lead to the issuing of laws such as OUG 194/2005, Law 137/2006 and Order 555/2006 the purpose of which is to lead to a responsible conservation and management of biodiversity in domestic animals. This legislation is to be enforced by the Compartment for the protection of animal genetic resources, a member of ANARZ. Among its aims is the creation of a biotechnology based bank for the conservation of animal genetic resources. In order to achieve this goal endangered breeds must be characterized.
While in a previous paper we undertook the characterization of the same animals form a morphological and productive point of view [1], our goal here is to do the same from a reproductive point of view by using specific indices. It is the unanimous opinion that these are the best reflection of biological and economical efficiency in the reproductive area [2, 3].
Our purpose is to define the characteristics of sheep belonging to the two ecotypes, followed by selection and cryopreservation for the construction of a gene bank.

2. Materials and methods

A number of 605 females belonging to the hill ec type and 245 to the mountain ecotype, Tsigaie breed were studied from the autumn of 2008 until the spring of 2010. During the reproductive season October – November 2009 their numbers were

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reduced to 75 animals and 90 animals respectively. These females will be further used for the germplasm (oocytes, embryos) cryopreservation experiments. The females were chosen according to phenotype, and their productive, reproductive and genetic value. The index values for these criteria were close to population average and animal ages were heterogeneous. The calculated reproductive indices are [2, 4]: sheep in oestrus (ewes/breaded ewes x 100), insemination index (inseminated sheep/lambed sheep), pregnancy rate (pregnant sheep/breaded sheep x 100), index of abortions (aborted sheep/pregnant sheep x 100), lambed sheep (lambed sheep/ewes x 100), sterility index (infertile ewes/ewes x 100), prolificacy index (resulted lambs/lambed ewes x 100), fertility index (resulted lambs/ewes x 100). The values can be seen in the tables below. The keeping and feeding were according with the weather conditions in autumn and spring.

3. Results and discussion

As is apparent from the data in table 1, the breeding season began in October for most of the animals. Oestrus appeared 15 days later in ewes belonging to the mountain ecotype. As a sign of optimal keeping and favourable weather conditions females manifested heat shortly after contact with rams.

Table 1. Breeding in the 2008-2009 season

No.	Number of	Hill ecotype		Mountain ecotype	
		2008	2009	2008	2009
1.	Sheep in oestrus	574	75	209	83
2.	Inseminated ewes	574	75	209	83
3.	Inseminations	652	118	250	107
4.	Anoestrous sheep	522	57	170	57
5.	Gestations	564	75	206	83
6.	Abortions	10	-	18	-
7.	Breeding ewes	605	75	209	90

Given that the two populations are isolated from a reproductive point of view, inseminations aimed to induce gestation but avoid inbreeding. All sheep in heat during the two years were inseminated.

Table 2. Reproductive indices in the 2008 breeding season

No.	Index	Hill ecotype	Mountain ecotype	Diffe-rences
1.	Sheep in oestrus (E%)	94.87	85.31	9.56
2.	Insemination index (I%)	101.77	138.88	-37.11
3.	Pregnancy rate (G%)	93.22	84.08	9.14
4.	Index of abortions (A%)	1.77	8.73	6.96
5.	Lambed sheep (N%)	89.75	74.69	15.06
6.	Fertility index (F%)	93.22	73.46	19.76
7.	Sterility index (Sm%)	0.51	14.69	14.18
8.	Prolificacy index (Pf%)	100.71	106.66	-5.95
9.	Fecundity (Fn%)	98.25	98.56	-0.31

The oestrus index (table 2) calculated for the data gathered during the autumn of 2008 indicates that 94.87% out of the breeding ewes belonging to the hill ecotype manifested heat. The corresponding value for the mountain ecotype is only 85.31%. This is below the minimum for the breed and it probably stems from a failure to provide the necessary keeping and feeding conditions. Their lack resulted in a decrease of the oestrus index by 9.56% when compared with the hill ecotype.

The insemination index is above 100% in both cases showing us that 38.88% surplus inseminations were necessary for a birth in the mountain ecotype and 1.77% for the hill ecotype.

Pregnancy rate was calculated after birthing season had ended. The number of gestating females was taken into account whether foetus was aborted or not. Its value is higher by 9.14% for the hill ecotype than the mountain ecotype. This is a good indication of a more difficult breeding in the latter.

Abortions occur with a frequency of only 1.77% in sheep belonging to the hill ecotype. This is more favourable than the 8.73% calculated for the mountain ecotype. This is probably the result of reproductive disorders that lead miscarriages. An increased sensitivity and also inbreeding must also be considered.

The fertility index amounts to 93.22% for the hill ecotype and 73.46% for the mountain ecotype. Given that the latter is 16.54% below what is deemed to be economically efficient our considerations regarding the abortion index are correct.

The sterility index is complementary to the oestrus index and confirms the results for the first parameter. A very large number of females belonging to the mountain ecotype did not manifest oestrus. This can be attributed to suboptimal preparation of ewes for the breeding season and to more liberal criteria for the selection of breeding animals.

The percentage of lambed ewes reveals that 89.75% sheep belonging to the hill ecotype give birth. The 15.06% difference is the result of keeping and feeding but also of the ecotype's genetic potential.

The Tsigaie prolificacy index should be between 105 and 114%. The animals comprised in this analysis had a 100.7% index for the hill ecotype and 106.6% for the mountain ecotype, despite health and keeping.

During the autumn of 2009 certain animals were chosen for further study and germplasm cryopreservation. Four reproductive indices were calculated for these females (table 3).

The oestrus index reaches 100% indicating that all the ewes belonging to the hill ecotype manifested heat while for the mountain ecotype the same parameter is calculated at only 92.22%.

Pregnancy rate and fecundity are identical to the oestrus index and demonstrate that all heat manifesting ewes are gestated. All three indices are higher by 7.78% in the hill ecotype. This situation confirms our findings for the 2008 breeding season.

Table 3. Reproductive indexes in the 2009 breeding season

No.	Index	Hill ecotype	Mountain ecotype	Differences
1.	Sheep in oestrus (E%)	100.00	92.22	7.78
2.	Fecundity (Fn%)	100.00	92.22	7.78
3.	Pregnancy rate (G%)	100.00	92.22	7.78
4.	Breeding ewes (animals)	75.00	90.00	15.00

4. Conclusions

After a final analysis on the reproductive indices for the two ecotypes it is apparent that:

1. Sheep keeping and feeding before breeding season influences reproduction even in local breeds, adapted to the environment.
2. The results for the bigger hill ecotype are better when compared to the mountain ecotype.
3. Morphological and physiological traits of the mountain ecotype warrant more attention to these animals if efficiency is to be achieved.
4. Populations isolated from a reproductive point of view are subject to a variety of factors in every stage of breeding.
5. Given the threats to the two Tsigaie populations, ex situ conservation of genetic diversity becomes as necessary as its in situ counterpart.

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