Effect of Using Melatonin Implants on Postpartum Reproductive Indices in Tigaia Sheep Breed

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Abstract
Investigations were carried out in a commercial farm from Turnu, Arad County, on a number of 110 indigenous adult ewes from the Tigaia breed. It is estimated by some authors that administration of subcutaneous melatonin implants during a period of 30 days, in lactating or dry ewes, would improve the reproductive performances in some sheep breeds. Subcutaneous melatonin implants (Melovin) were inserted to the ewes in doses of 18 mg. Current research, emphasized treated that from indigenous Tigaia breed, can be obtained superior reproduction indexes if the animals are treated with melatonin implants with 35 days before the mating season, differences from the untreated group being significantly ($p<0.001$). However, in sheep treated used melatonin implants, the lambing interval were reduced with 40 to 50%. It seems that use of melatonin implants Melovin type near the beginning of normal breeding season, increases the reproductive performance of adult ewes from the Tigaia breed.

Keywords: ewes, melatonin, sheep reproduction, Tigaie breed

1. Introduction

Tigaia breed represents 25% of Romania's entire flock, being found especially in southern Moldova, south-eastern Muntenia and some areas from Transylvania (Chisineu -Cris, Bontida, Turda, Brasov) and other counties like Mures, Covasna and Harghita. Tigaia it's a multipurpose breed (being reared for milk-meat and wool production), late-maturing breed, with the normal reproduction season in the autumn months (September-November), with lambing occurring during February and March.

Reproductive performances registered of the breed are lower, compared with different Merino breed types. External markets demands light lambs all year around, especially during the November-December period, when the prices are higher with 20 to 30 %.
Administration of progesterone associated with PMSG inserted into vagina became a widespread method for estrum induction and synchronization on sheep and goats, but it is an expensive method and requires a large volume of work, and generates an anti-PMSG reaction that reduces substantially the reproductive efficiency. [1, 2]
Use of Melatonin as a subcutaneous implant inserted in the ear area, has become a method frequently used on high performance sheep breeds in Western Europe. [3, 4]

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The continuous administration of melatonin through the hypodermic implants (Melovine and Requilin) allows the mimicry of short days (specific to the principal autumn season), even if retina accepts long spring – summer days. Sheep breeders that use natural mating will insert melatonin implants, starting with 30-40 days before reproduction period. [5, 6]
Purpose of the current research was to evaluate influence of the Melatonin implants (Melovin) on the reproduction indices of Romanian indigenous Tigaia sheep breed.

2. Materials and methods

The experiment was carried out on adult ewes from Tigaia breed, reared in a commercial farm from Turnu, Arad County. In 27 August 2009, the ewes included in the experimental group (n=110) were inserted with Melatonin implants (commercial product named Melovin).
The ewes had an average body weight ranging between 60 to 65 kg. After 30 days from the melatonin implants insertion, rams were introduced into the flock, for a 50 days time period.
Ewes from the experimental groups were monitored regarding time of entrance in estrum, mating and the evolution of the pregnancy up to parturition and lambs survival rates until weaning.
Based upon the primary data, we were calculated the birth rate (number of lambing obtained from 100 ewes), the prolificacy (number of lambs obtained from 100 laming ewes), natality (number of lambs/100 ewes), the survival rate (number of weaned lambs/100 born lambs) and the numeric productivity (number of weaned lambs from 100 ewes).
Ewes from both control and experimental groups were hosted during preparation for the reproduction season and as well during reproduction season on good quality pastures.
In order to test significance of the differences between the two experimental groups, Person test was performed (Table 1), following the calculation model bellow:

Table 1. Person test formulas

	Event organized	Event unfulfilled	
Group A	a_1	b_1	$a_1 + b_1 = n_1$
Group B	a_2	b_2	$a_2 + b_2 = n_2$
	$a_1 + a_2 = n_3$	$b_1 + b_2 = n_4$	$n_1 + n_2 + n_3 + n_4 = N$

$$\chi^2 = \frac{(a_1 b_2 - b_1 a_2)^2}{n_1 n_2 n_3 n_4}.N - 1$$

3. Results and discussion

The results registered in Tigaia sheep treated with Melatonin are presented in Table 2. Analyzing information from Table 2, it can be observed that all of the 106 ewes from Tigaia breed included in the experimental group have given birth to 103 lambs (97.1%) with 146 lambs and in the control group of 72 ewes, 70 females (97.2%) lambed 84 lambs. Prolificacy of the ewes included in the experimental group (141.7%), was with 21.7% higher than the prolificacy of the females from the control group (120%), differences were very significantly ($p<0.001$). For the lambing rate, differences were also high. Ewes from the experimental group had a lambing rate of 137.7%, with 21.1% higher than the lambing rate registered in the control group (116.6%), differences were also statistic significantly ($p<0.01$).
Survival rate of lambs (Table 3) from birth to weaning ranges in normal limits accepted for the breed, close to the experimental group (95.9%) and control group (97.6%). Index of lambs weaned (numerical productivity) is also significantly higher ($p<0.01$) in the experimental group (132%), with higher 18.2% compared with the control group (113.8%).
In Romania the first researches concerning the influence of melatonin implants have been carried out by Padeanu et al, [7, 8], which reported that

the use of melatonin implants at the beginning of (n=30) determined an significant increase with 13.3% of the birth rate when it is inserted to adult ewes. Using the same procedure on Stavropol Merino, the same authors emphasized the fact that they had registered extra 16 % lambs from the group treated with melatonin. Entire group coordinated by Padeanu [9, 10], carrying summer in Transylvanian Merino investigations on Tigaia breed (n=24), had communicated that melatonin implants determined a spectacular increase of prolificacy with 28.5% and shorted substantially the lambing period. But these results were generated on a small member of sheep.

Table 2. Postpartum reproduction indices in Tigaia ewes

Group	Ewes		Lambed ewes		Lambs	Prolificacy		Natality	
	Alive day 0	Alive at lambing	n	%	n	%	E-C	%	E-C
Experimental	110	106	103	97.1	146	141.7	21.7 ns	137.7	21.1***
Control	75	72	70	97.2	84	120.0		116.6	

E- experimental group; C – control group.
ns no significant, ** significant at $p<0.01$ and *** significant at $p<0.001$ by Person test

Table 3. Reproduction indices at weaning in Tigaia lambs

Group	Survival rate		Numerical productivity	
	n	%	%	E-C
Experimental	140	95.5	132.0	18.2**
Control	82	97.6	113.8	

In Western Europe, several studies were conducted in order to establish the influence of melatonin implants on the reproductive performance in different sheep breeds and populations.

Experiments carried out on five French sheep breeds, shown that ewes treated with melatonin implants were producing an extra 16 lambs on 100 ewes lambed, compared with control groups, and the lambing occurred earlier and more grouped. [11, 12]

In Spain, Abecia et al [13], has treated with 18 mg melatonin 71 ewes from Aragines breed on the start of March, and introduced the rams within the breeding flock after 42 days from the insertion, registering significant increase ($p<0.05$) of ewes in estrus. Ewes treated with melatonin displayed the first estrus much sooner compared with untreated ewes, but more than 80% from the treated ewes had silence heats, followed by a normal cycle. Same authors, Abecia et al [14] had done another experiment on an impressive number of sheep (1932) from three breeds: Aragonesa, Assaf and Merino, belonging to 12 commercial farms. Melatonin implants were inserted in ewes during the winter period (1 January-15 February and 1 April-15 May). Ewes from Aragonesa breed had produced more lambs per ewe (1.16), compared with the ewes from the control group (0.83) in April, same situation was registered in May (1.23 compared to 0.97). In Assaf ewes, results were more modest in January (0.62 lambs/ewe), in February (0.64 compared to 0.32), and better results in May (0.77 compared to 0.54). In Merino treated with melatonin group, the effect was evident only between January-February period (0.91 lambs/ewe, compared with 0.61). Author's conclusion was that melatonin implant on big flocks has improved the lamb production from studied sheep breeds, even if economic efficiency may present variations depending on the breed, season and farm conditions. Forcado et al [15], from the University of Zaragoza reported that on older ewes (10-11 years), melatonin can functionally restore the neuro – endocrine system, after it was initially affected by senescence.

Current experiment was carried out on a greater number of animals from the Tigaia sheep breed (n=110), and results suggests that usage of melatonin implants Melovin close to normal breeding season increases the reproductive performances of adult ewes from Tigaia breed.

4. Conclusions

In Tigaia ewes treated with melatonin implants (18 mg) prolificacy indices (+21.7%), natality (+21.1%) and numerical productivity (+18.2%) are significantly ($p<0.01$) higher compared with ewes from the control group.
In treated ewes, lambing season was shortened by half (20 days) compared to untreated ewes (38 days).

Acknowledgements

This work was supported by grant no. 1091/2009 code CNCSIS-2389, financed by UEFISCSU.

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