Effects of Using Melatonin Implants and Syncro-Part Pessaries + PMSG on Reproduction Performance in Tsigai Breed Ewes

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Abstract
Investigations were carried out in a commercial farm from Beba Veche, western Romania, on a number of 80 yearling ewes of 17-18 months of age from the native Tsigai. First group (V1), numbering 40 ewes received during out of season breeding (30.05.2011) a dose of 18 mg subcutaneous melatonin implants (Melovin®), while the second group (V2) consisting out of 40 ewes were treated with subcutaneous melatonin implants + 30 mg FGA (Syncro-Part pessaries) + 500 IU PMSG. Control group was represented by 40 intact females. Ewes were put to ram in 7th of July 2011. Researches shown that in ewes treated with melatonin, 30 mg FGA + 500 IU PMSG (V2) the conception rate was of 82.1%, with a prolificacy of 150%, and a weaning rate of 1.2 lamb/ewe. In V1 group, the weaning rate was of 0.9 lambs/ treated ewe, with significantly lower production costs. Ewes from the control group produced a lamb crop of 0.42 lambs/ewe, significantly less ($p \leq 0.05$) comparing to V1 and V2 experimental groups. It was concluded that in Tsigai breed, although the V2 group performed better (producing 48 lambs) compared to V1 group (36 lambs), the difference of 12 lambs does cover additional production costs, therefore the use of melatonin implants alone should be recommended.

Keywords: melatonin implants, pessaries, PMSG, reproductive performance, Tsigai breed

1. Introduction

During the year, the selling price of milk lambs differ greatly. For some years now, the best price is obtained (11-14 lei / kg) for lambs born in autumn and sold as milk lambs during winter (December 10 to 20).
Sheep breeding in Romania is currently the most dynamic from all agricultural sectors, with an annual growth rate of 7-8% and markets that are growing their demand for sheep products. Nowadays, Tsigai breed strains make up to 25% from the national flock, being reared in western and eastern part of the country. Tsigai ewes are being reared mainly for the lamb and milk productions.
Breeding season for indigenous of Tsigai breeds is during autumn, period which corresponds with the gradually reduction of the day-light form 14h/ 24h to a 12h / 12h ratio (1:1). Major differences were reported between breeds, while fine wool breeds manifest estrus at a light-dark ratio of 1:1 (September), the less improved, coarse wool breeds go into estrous during months with longer dark nights (October) [1].
In general, in Tsigai ewes proper feed and managed, 30-50% will manifest estrus during

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spring season as well (April-May), while in years with severe drought, 80-90% of the ewes will not manifest estrous. In order to improve reproduction performance in this ewes a series of methods could be applied, the most frequent is one which uses exogenous progesterone treatments and PMSG [1].

Administration of progesterone associated with PMSG became a widespread method for estrous induction and synchronization in sheep and goats. However, it is an expensive method and requires a large volume of work, and generates an anti-PMSG reaction that reduces substantially the reproductive efficiency [2,3].

However, vast majority of the Romanian breeders do not show interest to applying this methods in their farms due to the high cost of treatments (4.5-5 Euros/ewe) [3], and also due to the high labor input needed.

Photoperiodic effects are being used during summer seasons, when the light/dark ratio is much in favor of light (14-16 light/day). Keeping the ewes in dark sheds or using melatonin implants, might lead to an increase of the number of ewes that go into estrus.

The continuous administration of melatonin through the hypodermic implants (Melovin® and Reguilin) allows the mimicry of short days (specific to 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 [4, 5].

Use of Melatonin as a subcutaneous implant inserted in the ear area, has become a very important method used on high performance sheep breeds in Western Europe. [5,6,7].

Sheep breeders are interested to synchronize estrus and get better reproductive performances.

Aim of the current research was to evaluate influence of the Melatonin implants (Melovine) administered alone or in combination with FGA and PMSG, on the reproduction indices of Romanian indigenous Tsigai sheep breed during summer season.

2. Materials and methods

Experiments were carried out in a commercial farm from Beba Veche, Timis country in 2012, on a number of 120 Tsigai gimmers of 17-18 months of age.

Three experimental groups were set-up, as follows: V1 – 45 gimmers, group that was treated subcutaneous with 18 mg of melatonin (Melovin®) in the peri-auricular area; V2 – 40 gimmers treated with melatonin implants, Syncro-Part sponges (FGA 30 mg) and 500 IU PMSG (Folligon); V3 – 20 un-treated gimmers, which was considered the controls group.

The ewes had an average body weight ranging between 50 to 60 kg. Ewes were put to ram in June, for a period of 40 days.

Ewes from the experimental groups were monitored regarding time of entrance in estrus, mating, evolution of the pregnancy up to parturition natality and lambs survival rates until weaning. Birth rate (number of lambing /100 ewes), the prolificacy (number of lambs /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 / 100 ewes) were calculated. [1] Ewes from both control and experimental groups were kept during reproduction season on good quality pastures.

In order to test significance of the differences between the two experimental groups, Pearson test was performed (table 1), following the model bellow:

Table 1 Pearson 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

Results regarding post-natal reproduction indices and insertion are being presented in Table 2.

Data shown in the Table 2 presents that in Tsigai gimmers, in the experimental group V2 ewes, which were treated with 18 mg melatonin, Syncropart pessaries impregnated with 30 mg of FGA and 500 IU PMSG (Folligon commercial product), registered the best reproductive performances. Thus, out of the 25 gimmers treated, 20 lambed (80%) with a average prolificacy of 140%, 112% natality and a weaned lambs index of 100%, being obtained one lamb/hormonal treated ewe.

Worth mentioning is that during reproduction season, during summer season (in July), the temperatures were extremely high (32-38°C), therefore the temperatures might had influenced negatively the conception rates of the females.

Table 2. Reproduction performance of Tsigai gimmers following the out of season breeding hormonal treatments

Experimental group		Ewes	Ewes alive at lambing season	Ewes which lambed		Lambs	Prolificacy	Natality	Survival rates		Numerical productivity
				n	%		%	%	n	%	%
Melatonin (V_1)		40	40	30	75.0	36	120.0	90.0	33	91.7	82.5
Melatonin + Syncropart + PMSG (V_2)		40	39	32	82.1	48	150.0	123.1	42	87.5	107.7
Control (C)		40	40	16	40.0	17	106.3	42.5	16	94.1	40.0
Differences	V_1 vs C			35***			14.7*	47.5***	- 2.4^{NS}		42.5***
	V_2 vs C			42.1***			43.7***	80.6***	- 6.6^{NS}		67.7***
	V_1 vs V_2			7.1^{NS}			30***	33.1***	4.2^{NS}		25.2**

*p<0.05; ** p<0.01; *** p<0.001; E –experimental group; C – control group

In V1 group, ewes treated with melatonin alone, 75% of the females lambed and the average prolificacy was of 120%, natality of 90% and numerical productivity 82.5%, values registered being very close to those from the V2 group.

In the control group, all reproduction postnatal indices had significantly (p<0.01) lower values compared with the two experimental groups, 40% conception rate, 106.3% litter size, 42.5% natality, 40% numerical productivity, respectively. Therefore, when compared to prolificacy registered by V2 group, prolificacy in the controls was with 43.7% lower (p<0.01) and weaning rate lower with 45% (p<0.001). Significant differences were registered when controls were compared with the V1 group, to which the prolificacy is lower with 14.7% (p<0.05), and the number of weaned lambs was lower with 47.5% (p<0.001).

Between the two experimental groups (V1 and V2) significant (p>0.05) differences were prolificacy, natality and numerical productivity.

Survival rate of lambs until weaning was very close between the controls (94.1%) and the experimental groups (87.5% in V2 and 91.7% in V1), differences being insignificant (p>0.05).

In Romania the value of a newborn lamb is considered 50 RON (4 kg x 12.5 RON/kg = 50 RON), while a melatonin implant costs 2 Euros, and a Syncropart sponge + 500 IU PMSG costs 2.5 Euros, therefore a melatonin treatment costs 2 Euros (V1) and a treatment with melatonin and pessaries costs 4.5 Euros (V2).

Ewes from V2 produced a number of 48 lambs, and those from V1 produced 36 lambs, difference of 12 lambs represents 600 RON, much more than difference in treatments costs between the two experimental variants (V1 = 80 Euros, V2 = 180 Euros). Therefore, it might be concluded that results registered in V2 group, although superior are economically viable in Tsigai breed.

In Greece, [8] have experimented on lactating multiparous native breeds, during spring season, using melatonin implants associated with pessaries (60 mg MAP) + 500 IU PMSG, and registered a lambing rate of 60.4% following AI, compared to 32.6% in the control group. A significant increase

of the prolificacy was registered as well, of 148% compared to 131%.

In Spain, Gomez et al. (2006) [9] have done experiments on a large number of ewes (548) of Manchega breed, during seasonal anestrous and lactation, and used pessaries impregnated with progesterone and chorionic gonadothropine (V1), and melatonin implants with effects of 100 days (V2). For both experimental groups, a conception rate of 78% was registered. Authors concluded that progesterone impregnated pessaries as the melatonin implants are improving the reproductive performances of ewes during out of season reproduction in lactating ewes.

Researchers from New Zeeland [1] concluded that treatment with melatonin + progesterone + eCG has induced a significant growth of the conception rate (67%) compared with controls (47%). Experimental groups treated with melatonin + progesterone without eCG have not lead to satisfying results in New Zeeland.

In Romania, first researches regarding the influence of the melatonin implants have been carried out by Padeanu et al. in 2001 [10], which found that by using melatonin implants in Transylvanian Merino during the beginning of summer (n=30) lead to a significant ($p<0.05$) growth of the natality with 13.3% in multiparous ewes. Using the same treatment in Stavropol Merino, additional 16% of improvement of the conception rate was registered, compared to the controls.

The same author reports in Tsigai ewes treated with melatonin implants an increase of the litter size (+ 21.7%), natality (+ 21.1%) and numerical productivity (+ 18.2%) significantly higher ($p < 0.01$) compared with Tsigai ewes from the control group [11].

Researches conducted by [12] and [13] have studied effects of melatonin implants influence alone or in association with vaginal pessaries (Chronogest) in Palas Merino during out of season breeding and report the following results: - non-return rate in the case of the two associated treatments was higher, compared to groups in which the two treatments were done independently; - Conception rate was good when the two treatments were combined (89.4%), compared with 85.2% in Chronogest single treatment or 75% in melatonin alone treated group. Same experiment was done on Palas Merino in December, period in which the light-dark ration is close to 1:1, and it was reported that ewes treated with melatonin + Chronogest and PMSG had a similar treatment efficiency (58.3%) with the ewes treated only with pessaries and PMSG.

On researches concerning the Merino breed treated with melatonin (18 mg) and pessaries, containing 30 mg FGA + 500 IU PMSG during out of season breeding [14] found an increase of the prolificacy (+20%), natality (+52%) and numerical productivity (45%), values significantly higher compared with the control group.

4. Conclusions

In Tsigai gimmers treated melatonin (18 mg) + pessaries (30 mg FGA) + 500 IU PMSG during out of season breeding, prolificacy (+43,7%), natality (+80,6%) and numerical productivity (+67,7%) were significantly higher compared with the ewes from the control group.

For Tsigai gimmers treated with melatonin alone, the prolificacy (+14,7%), natality (+47,5%) and numerical productivity (+42,5%) were significantly ($p<0.05$) higher compared to controls.

References

1. Pădeanu I., Creşterea ovinelor. Reproducere, Ameliorare, Tehnologii de creştere. Ed. Mirton, Timişoara, 2012.
2. Constantin, N., Cotruţ, M., Sonea, A., Fiziologia animalelor domestice, Ed. Coral Sanivet, Bucureşti, 1998.
3. Dudouet, Ch., La production du mounton 2 edition, Ed. France Agricole, 2003.
4. Chemineau, Ph., Declenchement de l`activite sexuele en avance de saison chez les brebis et les agnelles en lutte naturelle. Publ. INRA, 1995.
5. Chemineau, P., Malpaux, B., Petits ruminants: photoperiodisme et reproduction. La Semaine Veterinaire fevrier 97, 1997, pp. 18-20.
6. Forcada, F., Effect exogen melatonin and plane of nutrition after weaning on estrus activity, endocrine status and ovulation rate in ewes lambing in the seasonal anestrous, Theriogenology, 43, 1995, pp. 1179-1193.
7. Forcada, F., Abecia J.A., Casao A., Cebrian-Perez, J.A, Muino-Blanc, O.T., Palacin, I., Effects of ageing and exogenous melatonin on pituitary responsiveness to gnrh in ewes during anestrus and the reproductive season, Theriogenology, Zaragoza, Spain., 67, 2007, pp. 855-862.
8. Laliotis, V., Vosniakou, A., Zafrakas, A., Lymberopoulos, A., Alifakiotis, R., The effect of melatonin on lambing and litter size in milking ewes

after advancing the breeding season with progestagen and PMSG followed by artificial insemination. Small Ruminant Research 31, Grecee, 1998, pp.79-81.

9. Gomez, J.D., Balasch, S., Gomez, L.D., Martino, A., Fernandez, N., A comparison between intravaginal progestagen and melatonin implant treatments on the reproductive efficiency of ewes. Small Ruminant Research. Vol. 66. Issues 1-3 november, Spain, 2006, pp. 156-163.

10. Pădeanu I., Guler A., Voia O., Dumitrescu Gabi, Reproductive efficiency of a new generation of vaginal devices collagen. Simpozion Herceg-Novi, vol. XXXIV, 2001, pp. 39.

11. Pădeanu I., Voia S., Găvojdian D., Mircu C., Pascal C., Sauer Maria, Rău V., Frăţilă I. Effect of using melatonin implants on postpartum reproductive indices in Ţigaia sheep breed. Lucrări ştiinţifice Zootehnie şi Biotehnologii, Timişoara, vol. 45(2), 2012, pp. 462-465.

12. Zamfirescu Stela, Pivoda I., Creţu Lidia, Pop A., Anghel Fl., 1994. Inducerea estrului fertil la oi şi capre în afara sezonului natural de montă prin diferite tratamente hormonale. Lcr. Şt. ICPCOC Palas, vol. 7, p. 223-230.

13. Nadolu Dorina, Manipularea funcţiei de reproducţie la oaie cu ajutorul melatoninei şi fotoperiodismului. Teză de doctorat, USAMV Bucureşti, 2009.

14. Padeanu I., Voia S., Gavojdian D., Fratila I., Maria Sauer, Pascal C., Calin I., Mihaela Petcu. Effects of Using Melatonin Implants and Syncro-Part Pessaries + PMSG on Reproduction Performance in Transylvanian Merino Breed Ewes. Scientific Papers: Animal Science and Biotechnologies, Timişoara, 46 (1), 2013, pp. 367-370.