

INFLUENCE OF THE SALT-FREE – SALT DIET AND THE RAM EFFECT ON MAIN REPRODUCTIVE TRAITS OF EWES FROM SYNTHETIC POPULATION BULGARIAN MILK

N. METODIEV^{1*}, E. RAICHEVA¹ and I. RALCHEV²

¹*Institute of Animal Science, Sheep Breeding Department, BG-2232Kostinbrod, Bulgaria*

²*University of Forestry, Faculty of Veterinary Medicine, BG - 1547 Sofia, Bulgaria*

Abstract

METODIEV, N., E. RAICHEVA and I. RALCHEV, 2009. Influence of the salt-free – salt diet and the ram effect on main reproductive traits of ewes from synthetic population Bulgarian milk.

Bulg. J. Agric. Sci., 15: 598-603

The aim of this work was to study the effect of combined treatment of the salt free-salt diet and ram effect on main reproductive traits of ewes in different ages from the Synthetic Population Bulgarian Milk at the beginning of breeding season. The experiment was carried out with 107 ewes (in that number 26 maidens). The experimental ewes were at different age (between 1.5 and 6.0 years old) and respectively at different lactations (1-st, 2-nd, 3-rd and more), with middle weight 55-65 kg and body score estimation – 2.5-3.5. The ewes were divided in 4 groups according the range of lactation: I – maiden (1.5 years old); II-ewes at 1-st lactation; III - ewes at 2-nd lactation; IV- ewes at 3-rd and more lactation. Salt-free-salt diet was applied by the next scheme: first was salt-free diet, which continued 17 days. After that the ewes were put in salt conditions during 9 days (the salt lick were returned and in the concentrated forage was put salt (NaCl) in dose 20 g per ewe per day). The first day of salt diet coincided with the first day, in which ewes contacted with rams. Up to the beginning of breeding campaign, the rams were raised apart from ewes, in neighbor barn in the distance of 15 m. The ewes in estrus were detected by teasers once daily (1 teaser for 50 ewes) during 29 days. The ewes in estrus were inseminated according breeding plan artificially, vagino-cervically, with non-diluted semen. The parameters, that were studied, were: time of manifested estrus (at days) after the beginning of breeding campaign, fertility (at first estrus) and fecundity. 89,70% of the ewes were manifested estrus in the framework of 20 days as it was observed 2 surges – between day 1 and day 9 and between day 15 and day 20, after the beginning the breeding campaign. These results could be explained as a result of the ram effect and salt-free-salt diet and their synergic effect. The general fertility of the flock was 77. 00% and the fecundity was 127.27%.

Key words: ewes, salt-free-salt diet, ram effect, reproductive traits

Introduction

The synchronization of fertilities and births of ewes are main elements of the reproductive management in sheep-breeding. To achieve this, it is necessary 80-90% of the ewes from the flock to be fertilized in the frames of 3 or 4 weeks (21-28 days).

The methods of estrus synchronization can be classified as natural (non-hormonal) and pharmacological (hormonal) (Bankov et al., 1989; Tyankov et al., 2000; Wildeus, 2000; Danko, 2003). The pharmacological methods are more effective, however more expensive (Dankó, 2003).

Non-pharmacological methods are less effective, cheaper and easy to apply in practice. Non-pharmacological methods are alternative to the conventional methods of estrus synchronization, an important issue in today's consumer – driven climate (Martin et al., 2004). The most popular non-pharmacological methods are: the ram effect, flushing, salt-free-salt diet, the uses of vitamins and mineral supplements (Tyankov et al., 2000).

The reproductive response of anestrus ewes to the introduction of rams (i.e. ram effect) has long been established (Underwood et al., 1944). The introduction of ram or rams to isolated anoestrus ewes leads to the next reproductive reactions: increase of pulsatile secretion of LH, which may end with LH surge followed by ovulation (Knight et al., 1978; Oldham and Cognié 1980; Martin et al., 1983; Ungerfeld et al., 2004). The ram effect can be achieved without prior isolation of ewes from rams (Cusha et al., 1992). The ram effect is applicable in breeding season too, as the introduction of rams to cyclic ewes stimulates an increase in pulsatile LH secretion, independent of ewe genotype or stage of the estrous cycle (Hawken et al., 2007).

The method of salt-free- salt diet has applied traditionally in Bulgaria, but there weren't experimental data about its effect and the conditions, that got it (Todorov, 2008). The traditional use of salt-free-salt diet is in next scheme: beginning with salt-free diet with continuance of 6 or 7 days, and then salt diet followed as it continued the same days with dose of

salt (NaCl) 15-20 g per ewe per day (Solomonov, 1977; Tsofov et al., 2000; Hristova, 2007). In our previous investigation (Metodiev et al., 2007) we used salt-free-salt diet as a part of a scheme to achieve synchronized estrus at ewes from Ile de France breed in the next way: salt-free diet – 14 days, salt diet – 7 days.

The aim of this work was to study the effect of combined treatment of the salt free-salt diet and the ram effect on main reproductive traits of ewes in different ages from the Synthetic Population Bulgarian Milk at the beginning of breeding season.

Materials and Methods

The experiment was carried out in experimental farm of Institute of Animal Science (IAS) – Kostinbrod with ewes from Synthetic Population Bulgarian Milk (SPBM) from 17.06 to 02.08. 2007 with 107 ewes (in that number - 26 maidens). The experimental ewes were at different age (between 1.5 and 6.0 years old) and respectively at different lactation (1st, 2nd, 3rd and more), with middle weight 55-65 kg and body score estimation – 2.5-3.5.

At the moment of the beginning of the experiment, ewes were milking and they were stopped milking after the breeding campaign. The ewes were raised in pasture with individual flushing with 200-250 g concentrated forage (with content of crude protein 15%) per day. The reproductive status of ewes for the last 20 days before starting the experiment was characterized as anestrus without visible sexual cyclic activity. The ewes were divided in 4 groups according to the range of lactation: I – maiden (1.5 years old) (n=26); II-ewes at 1st lactation (n=35); III - ewes at 2nd lactation (n=24); IV- ewes at 3rd and more lactations (n=22)

Salt-free-salt diet was used for the non-hormonal inducing of synchronized estrus by the next scheme: first was salt-free diet, which means that the whole salt-licks were removed. The salt-free diet continued 17 days (from 17.06.07 to 04.08). On the day 18-th from the beginning of the experiment (05.07.08) the ewes were put in salt conditions, which mean that the

salt lick were returned and in the concentrated forage was put salt (NaCl) in dose 20 g. per ewe per day. The salt diet continued 9 days. The first day of salt diet coincided with the first day, in which ewes contacted with rams.

Up to the beginning of breeding campaign, the rams were raised apart from ewes, in neighbor barn in the distance of 15 m. The ewes in estrus were detected by teasers once daily, in the morning for 1- 1.5 hour (1 teaser for 50 ewes). The daily teaser contacts continued 29 days. The ewes in estrus were inseminated according breeding plan artificially, vagino-cervically, with non-diluted semen, as 1 ejaculate was divided to 2 ewes. Ewes was inseminated twice daily (morning and evening), but if some ewe showed estrus on the next day, it was inseminated again only in the morning. Thus every ewe from the experiment was inseminated minimum twice and maximum three times. For the artificial insemination, 4 stud-rams were used, as their daily capacity was up to 6 ejaculates (no more than 3 at the morning and no more than 3 at the evening). The quality of sperm (volume, motility and concentration in 1 ml) responded to the ram's standards.

The following reproductive traits were researched:

The time of manifesting estrus, (in days) – registered every day by teasers. The ewes in heat were inseminated artificially.

Fertility – defined as the ratio of the number of ewes pregnant to the number of ewes, exposed to artificial insemination at first estrus.

Fecundity – defined as the number of born lambs from pregnant ewes (included all born lambs – live born, dead born and aborted).

Fertility and fecundity were calculated after lambing.

The data were calculated by statistical program SPSS 13.0 for Windows. The significant of the differences between groups were evaluated by t-criterion of Student at $P < 0.05$.

Results

The results about the time of manifesting estrus and the number of ewes, shown estrus were presented in Table 1 and Figure 1. The manifestation of estrus from ewes was characterized with two periods, as every period had distinct surge. The first period was between day 1 and 9 from starting the salt diet and ram introduction. The second was between days 15-20 from the starting. The surge for the first period was on days 5 and 6 (by 13 ewes per day), and the surge for second period was on day 16 (8 ewes). There was a tendency to a higher number of ewes with manifested estrus for the first period (54 ewes) than second (34 ewes). The middle number of ewes with manifested estrus was 6 for the first period and 5.66 for the second.

The relative part of the ewes (generally for the flock and for each experimental group) responded to the applied scheme was presented in Table 2. From the whole ewes, included in the experiment, 100 ewes or 93.45% were reacted. The relative part of responded ewes from the groups was between 91.4 % and 100%.

The general fertility of the flock was 77.00% (Table 3). The ewes at second lactation (III group) had the highest fertility, and the lowest had maidens (I group)

Table 1
Number of ewes, that manifested estrus, by periods of days and mean for periods

Days	Number of ewes with estrus for the period	Mean number of ewes with manifested estrus for every day of period
1-9	54	6
10-14	8	1.6
15-20	34	5.66
20-29	4	0.44

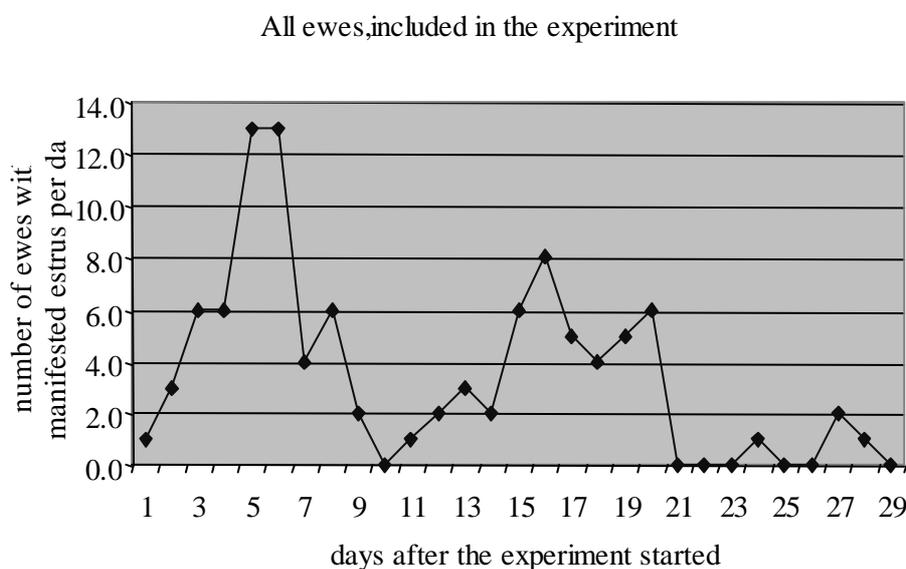


Fig. 1. Number of ewes, that manifested estrus by the whole experimental period

Table 2

The relative part of ewes (generally for the flock and by groups), responded to the applied scheme

	Generally for the flock	I group	II group	III group	IV group
All ewes	107	26	35	24	22
Reacted, number	100	24	32	22	22
Percentage, %	93.45	92.3	91.42	91.66	100

– 58.33%. The differences of fertility between I and II group and between I and III group were significant ($P < 0.05$).

The fecundity of pregnant ewes was 127.27% (Table 3), as the highest fecundity had ewes from III group – 136.84%, and the lowest had I group – 136.84%.

Discussion

The obtained results from our experiment showed, that in the frames of 20 days, 96 ewes from total number 107 or 89.7% were manifested estrus with two clear surges (Figures 1 and 2). First surge was on days 5 and 6 after the ram introduction and starting the salt diet. Ewes generally ovulate in response to

ram introduction within 54 h (Oldham et al., 1978), but the first ovulation following introduction of rams usually is not accompanied by behavioral estrus (Oldham and Cognie, 1980; Nugent et al., 1988). In some ewes there is an initial short luteal phase of 4-5 days, then a second ovulation without any signs of estrous, followed by a luteal phase of normal duration (Ungerfeld et al., 2004). In our experiment, the first surge coincided with this second silent ovulation. But this ovulation wasn't silent, which was confirmed by the manifested estrus and the high percentage of fertility (77.00% generally for the flock). The manifestation of sterling estrus could be explained as a result of the ram effect and salt-free-salt diet and their synergic effect. The salt-free-salt diet operates by reflective pathway as a stimulus on reproductive system

Table 3
Fertility and fecundity of ewes with manifested estrus – generally for the flock and by groups

Index	All ewes		I group		II group		III group		IV group	
	n=100		n=24		n= 32		n= 22		n=22	
	%	Num-ber	%	Num-ber	%	Num-ber	%	Num-ber	%	Num-ber
Fertility – number of fertilized ewes and percentage	77	77	58.33	14	84.37	27a*	86.36	19b*	77.27	17
Fecundity –number of born lambs and percentage	127.27	97	121.14	17	125.92	34	136.84	25	123.52	21

Note: a* – significance of the differences between values of fertility of I and II group, $P < 0.05$

b* - significance of the differences between values of fertility of I and III group, $P < 0.05$

(Bankov et al., 1989) and the success of the ram effect of inducing breeding activity in anestrus ewes increases as the start of the normal breeding season approaches (Oldham and Cownie 1980; Martin et al., 1986). Our results confirmed the statement of Tyankov et al. (2000), the effect of salt-free-salt diet is 40-50% of ewes come in estrus at first week from starting the breeding campaign.

The second surge ewes in heat were on day 16 (the period 15-20 day) after starting the experiment and could be explained with the ram effect. According to Oldham et al., 1978, ewes show estrus at their second ovulation, which was between 17-th and 20-th day after the first silent ovulation. According to Martin et al., 1986, there are differences of ovarian response at ewes which could lead to two surges of manifesting synchronized estrus induced by the ram effect- first is between 17-20 days and the second is between 21-25 days after ram introduction. In our experiment there wasn't surge between 21-25 days.

The highest percentage of fertility (77% generally for all ewes) confirmed that the ovulations were sterling. The significant differences of fertility between I group to II and III we explained with anatomical and physiological special features of maidens. Reproductive failure following mating is usually much higher in ewe lambs for variety of reasons (Quirke et al., 1983). Moreover in the ewe, the incidence of late embryonic

loss is higher in ewe lambs and ewes over 6 years than it is in mature ewes which is due to factors associated with the embryo rather than uterine environment (Jainudeen and Hafez, 1993).

The fecundity of fertilized ewes (127%) was similar to the fecundity of the flock for the last years (Hinkovsky et al., 2008).

Conclusion

According to the obtained results, we could give a positive estimation of the treated scheme and to recommend it to the sheep farmers.

High percent (94.45%) of the experimental ewes reacted positively to the scheme for synchronization of estrus and fertilizations. 89.70% of the ewes were manifested estrus in the framework of 20 days as it was observed 2 surges – between day 1 and day 9 and between day 15 and day 20, after the beginning of the breeding campaign. These results could be explained as a result of the ram effect and salt-free-salt diet and their synergic effect. The fertility was 77.00%, as it was the lowest at the maidens – 58.33%. The fecundity was 127.27%, as there were no big differences between groups.

This article was presented in the 1st Conference of the Balkan Network for the Animal Reproduction and Biotechnology, IBIR-BAS, 17-18.02.2009.

References

- Bankov, N., L. Kanchev, L. Kostov and K. Vlahov**, 1989. Biology and biotechnology of reproduction of domestic animals. *Publishing House of BAS*, Sofia, pp. 73-74 (Bg).
- Cushwa, W. T., G. E. Bradford, G. H. Stabenfeldt, Y. M. Berger and M. R. Dally**, 1992. Ram Influence on Ovarian and Sexual Activity in Anestrus Ewes: Effects of Isolation of Ewes from Rams Before Joining and Date of Ram Introduction. *J. Anim. Sci.*, **70**: 1195-1200.
- Danko, G. N.**, 2003. Some Practical and Biotechnological Methods for Improving Reproduction Traits in Sheep, www.date.hu/acta-agraria/2003-11/novotnine.pdf
- Hawken, P. R., A. P. Beard, T. Esmaili, H. Kadakowa, A. C. O. Evans, D. Blanche and G. B. Martin**, 2007. The introduction of rams induces an increase in pulsatile LH secretion in cyclic ewes during breeding season. *Theriogenology*, **68**: 56-66.
- Hinkovskiy, Tz., E. Raicheva and N. Metodiev**, 2008. Estimation of the productivity of ewes from the Bulgarian Dairy Synthetic Population. *Anim Sci.*, **3**: 35-42 (Bg).
- Hristova, Ts.**, 2007. PhD Thesis, Agricultural Academy, (Bg).
- Jainudeen, M. R. and E. S. E. Hafez**, 1993. Reproduction in farm animals/edited by E.S.E. Hafez – 6th ed., 272 pp. (USA).
- Knight, T. W., A. J. Peterson and E. Payne**, 1978. The ovarian and hormonal response of the ewe to stimulation by ram early in the breeding season. *Theriogenology*, **10**: 343.
- Martin G. B., R. J. Scaramuzzi and D. R. Lindsay**, 1983. Effect of the introduction of rams during the anestrus season on the pulsatile secretion of LH in ovariectomized ewes. *J. Reprod. Fertil.*, **67**: 47-55.
- Martin, G. B., C. M. Oldham, Y. Cownie and D. T. Pearce**, 1986. The physiological responses of anovulatory ewes to the introduction of rams-review. *Livestock Prod Sci.*, **15**:219-247.
- Martin, G. B., J. T. Milton, R. H. Davidson, G. E. Banchemo Hunzicker, D. R. Lindsay and Blanche**, 2004. Nutritional and environmental effects on reproduction in small ruminants. *Anim. Reprod. Sci.*, **82-83**: 231-45.
- Metodiev, N., E. Raicheva and I. Ralchev**, 2007. The abilities for combinative treatment of nonhormonal and hormonal methods to achieve synchronized estrus at ewes from Ile de France breed, Proceeding from scientific conference “Tradition and present state of veterinary medicine: University of Forestry, Sofia, pp. 171-176 (Bg).
- Nugent, R. A., D. R. Notter and W. E. Beal**, 1988. Effects of ewe breed and ram exposure on estrous behavior in May and June. *J. Anim. Sci.*, **66**:1363.
- Oldham C. M., G. B. Martin and T. W. Knight**, 1978. Stimulation of seasonally anovulator Merino ewes by rams. I. Time from introduction of the rams to the preovulatory LH surge and ovulation. *Anim. Reprod. Sci.*, **1**: 283.
- Oldham, C. M. and Y. Cownie**, 1980. Do ewes continue to cycle after teasing? *Proc. Aust. Soc. Anim. Prod.*, **13**:82.
- Quirke, J. F., T. E. Adams and J. P. Hanrahan**, 1983. Artificial induction of puberty in ewe lambs. In: W. Haresign (Ed.) Sheep Production. Butterworths, London, Ch. 21, 409 pp.
- Solomonov, H.**, 1997. Possibilities for increasing of the meat production from sheep. Thesis, SPU-Cattle and Sheep Husbandry, Institute of Animal Science-Kostinbrod, pp. 100-145 (Bg).
- Todorov, N.**, 2008. Feeding and care of sheep. *Publishing house “Matkom”*, Sofia, 154 pp. (Bg).
- Tsolov, S., M. Dimitrov, P. Georgiev, I. Ivanov and St. Yotov**, 2000. Practical guide in veterinary obstetrics, gynecology and artificial insemination. *Printing house “Contrast”*, v. Bogomilovo, 28 pp. (Bg).
- Tyankov, S., I. Dimitrov, I. Stankov, R. Slavov and D. Panayotov**, 2000. Sheep and goat breeding, “*Abagar*”, Veliko Tarnovo. 384 pp. (Bg).
- Underwood E. J., F. L. Shier and N. Davenport**, 1944. Studies in sheep husbandry in Western Australia. *J. Agric West Aust*, **11**: 135-143.
- Ungerfeld, R., M. Forsberg and E. Rubianes**, 2004. Overview of the response of anoestrus ewes to the ram effect. *Reprod. Nutr. Dev.*, **16**: 479-490.
- Wildeus, S.**, 2000. Current concepts in synchronization of estrus: Sheep and goat. *J. Anim. Sci.*, **77**: 1-14.

Received August, 2, 2009; accepted for printing October, 4, 2009.