Bulgarian Journal of Agricultural Science, 18 (No 4) 2012, 501-505
Agricultural Academy

THE INFLUENCE OF HORMONE-VITAMIN-MINERAL TREATMENT ON REPRODUCTIVE EFFICIENCY OF ROMANOV EWES IN DEEP OFF-SEASON

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Abstract

MIJATOVIC, R., S. JOTANOVIC, M. VEKIC, G. SAVIC, M. PODZO and B. STANCIC, 2012. The influence of hormone-vitamin-mineral treatment on reproductive efficiency of Romanov ewes in deep off-season. *Bulg. J. Agric. Sci.,* 18: 501-505

Aim of study was to investigate the influence of hormone-vitamin-mineral treatment on reproductive efficiency of Romanov breed ewes in deep off-season. Experimental and control group consisted of 35 ewes each. Housing conditions, diet, hormonal treatment and insemination were identical for both groups. The difference between the experimental and control group was in the vitamin-mineral treatment. Ewes were treated with progestagens (30 mg FGA), using intravaginal sponges for 12 days. On day of sponge removal, all ewes were treated with 500 IU eCG. On the day of first insemination, ewes were treated with 250 IU hCG. Insemination was performed twice with freshly diluted sperm. Experimental group had fertility of 77.14±7.09%, fecundity of 140.00±6.45% and prolificacy of 181.48±7.11%. In the control group values of these parameters were 67.65±8.02%, 114.71±5.35% and 169.57±7.88%, respectively. Only the difference in fecundity was statistically significant ($p<0.01$). There were no statistically significant differences ($p<0.05$) in litter size and viability of lambs in the first 24 hours of life. Using the described hormonal treatment, estrus can be successfully induced and synchronized in deep off-season. With applying additional vitamin-mineral treatment reproductive performances can be improved, compared to the hormonal treatment only.

Key words: ewe, hormone-vitamin-mineral treatment, off-season, reproductive efficiency
Abbreviations: eCG – equine chorionic gonadotropine, FGA - fluorogestan acetate, hCG – human chorionic gonadotropine, LH – luteinising hormone, MAP – medroxyprogesterone acetate

Introduction

Sheep production in Bosnia and Herzegovina has extensive character and is orientated mainly to the production of lamb. The main limiting factor for its intensification is low production of present sheep breeds and rare using of biotechnology methods. Mating season runs from August to November, which gives seasonality to lamb production. Getting lambs outside the usual season directly affects the costs of production, increases the number of lambs obtained per sheep per year and allows the planning of production in line with market

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requirements. By induction and synchronization of estrus, especially in off-season, lamb production can be controlled and planned. For achieving this, most commonly used is hormonal method, combined with flushing feed effect. There are many different protocols of the hormonal method, and they are based on the extension or on shortening of corpus luteum activity.

Off-season estrus induction and synchronization are usually done by applying intravaginal sponges containing medroxyprogesterone acetate (MAP) or fluorogeston acetate (FGA) in combination with applying equine chorionic gonadotropine (eCG) on the day of sponge removal. Using combination of progestin and gonadotropins is made to achieve the induced oestrus and ovulation is accompanied by the manifestation of external estrus signs (Clin et al., 2001, Maurel et al., 2003). According to Cognie et al. (1970), without eCG application ovulation occurs later, and it is difficult to determine the optimal moment for insemination. Coyan et al. (2003) reported that hCG has a similar function as LH and can accelerate ovulation. After removing the sponges, ewes should show signs of estrus in 24 to 144 hours interval, but the highest incidence is between 30 and 60 hours (Simonetti et al., 2000; Vinoles et al., 2001). Sheep treated with hCG have elevated levels of circulating progesterone in the early stages of pregnancy (Ishida et al., 1999; Fuku et al., 2001) and greater weight of corpus luteum (Nephew et al., 1994), which have beneficial impact on pregnancy. In determining the dosage of hormonal preparations in order to achieve successful induction and synchronization of estrus, data about of the reproductive performances of used breed, age, general condition and health status, and stage of reproductive cycle should be considered.

The aim of study was to determine the effectiveness of used hormonal treatment to induce and synchronize estrus in deep off-season, and the impact of additional vitamin and mineral treatment on parameters of reproductive efficiency achieved by Romanov sheep, breed selected on high fertility.

Material and Methods

The study involved a total of 70 Romanov breed sheep, divided into two groups of 35 individuals each. Animals were in a parity range from one to four lambings. All sheep were in reproductive condition, with an average weight of about 45 kg. Lambs were weaned 30 days prior to the begining of experiment and the sheep were intensively fed in order to achieve the flushing effect.

Experiment was performed in the second half of July 2009. Intravaginal sponges containing 30 mg fluorogestan acetate (Chrono-gest, Intervet-Boxmer, Netherlands) were used as progestagen. Treatment with sponges lasted for 12 days, with day of their application taken as day 0. On the day of sponge removal, all ewes were treated with 500 IU of eCG (Folligon, Intervet-Boxmer, Netherlands), and 48 hours later with 250 IU of hCG (Pregnyl, NV Organon, Oss, The Netherlands), to ensure ovulation. The experimental group of sheep was additionally treated with 5ml of vitamins complex (Vitamin AD3E, Pliva, Zagreb, Croatia) and 10 ml of mineral solution (Calfoset, Krka, Novo Mesto, Slovenia), on the day of sponge application.

All sheep were inseminated twice with fresh diluted semen, which has been prepared two hours before use. The first insemination was performed 48 hours after treatment with eCG, and the second 24 hours later (15. and 16. day from the sponge removal). Volume of one insemination dose was 0.3 ml, with about 400 million progressively motile spermatozoa.

During the study, values of fertility (probability of pregnancy), fecundity (number of lambs/100 ewes) and prolificacy (number of lambs born/lambing) were monitored. Litter size and viability of lambs in the first 24 hours of life were also registered. Statistical analysis of the data was performed by using descriptive analysis and t-test (Hadzivukovic, 1973).

Results

Acheived parameters of reproductive efficiency of sheep are shown in Table 1.

Highly significant difference was found between experimental and control group in values of fecundity. There were no significant difference in values of fertility and proliferation. Although a statistically significant difference ($p<0.01$) was found only in the values of fecundity, the experimental group of sheep had a slightly

higher values of all three parameters of reproductive efficiency, which indicates that the vitamin-mineral treatment had positive affect on the expression of reproductive efficiency.

Distribution of sheep according to litter size and lamb vitality in the first 24 hours is shown in Table 2.

In relation to litter size no statistically significant difference ($p<0.05$) was found between experimental and control group. No statistically significant difference between experimental and control groups was found in the lambs viability obtained by litter size, although it was slightly higher in the experimental group. The absolute number of the lambs in experimental group was higher, so it can be said that their general viability was greater than in the control group.

Discussion

In our research, induction and synchronization of estrus in off-season were based on the extension of the luteal phase by using a combination of exogenous progestogens and gonadotropin. In addition to hormonal treatment, the experimental group of sheep was treated with vitamin-mineral preparations, in order to examine their impact on the values of reproductive parameters. For a better interpretation of the results, it is worth to note that research was conducted during July, deeply out of mating season, which certainly had an impact on achieved reproductive results.

Fertility of experimental group (77.14%) in our study was better compared to the results of Simonetti et al. (2002), who achieved fertility of 54.32% and 76.47% after a dual insemination of merino sheep with fresh diluted semen by using combination of progestogen (MAP) and two different doses of eCG (375 IU and 400 IU). Crosby et al. (2003) achieved fertility of 72.00% by applying the progesterone treatment and eCG. Better results than our study had Zeleke et al. (2005), who achieved fertility of 85.30% and 97.00% after applying MAP and FGA to Dorper sheep. Sahinovic et al. (2006) achieved fertility of 83.35% in Württemberg sheep during late anestrus using the natural mating. Other authors (Redmer et al., 2000; Safdarian et al., 2006; Dogan and Nur, 2006) had similar results of fertility in induced estrus in- and off-season.

Experimental group of sheep had higher value of fecundity compared to the results of Zeleke et al. (2005), who acheived values of 120.80% and 131.10%. Safdarian et al. (2006) acheived fecundity of 133.00% in karakul sheep by using the FGA and eCG. Both groups of sheep in our study had a higher fecundity values compared to the results of Kridli et al. (2006) who acheived fecundity of 77.70% in research conducted on awassi sheep using FGA and eCG.

Table 1
Parameters of reproductive efficiency of examined sheep (mean ± standard error)

Parameter	Group		Total
	Experimental	Control	
Fertility, %	$77.14 \pm _{7.09}{}^{a}$	$67.65 \pm _{8.02}{}^{a}$	$72.46 \pm _{3.38}$
Fecundity, %	$140.00 \pm _{6.45}{}^{a}$	$114.71 \pm _{5.35}{}^{b}$	$127.54 \pm _{4.39}$
Prolificacy, %	$181.48 \pm _{7.11}{}^{a}$	$169.57 \pm _{7.88}{}^{a}$	$176.00 \pm _{4.55}$

[a,b] Values in same row marked with different letters in superscript are statistically significantly different ($p<0.01$)

Table 2
Distribution of sheep according to litter size and lamb viability in the first 24 hours (mean ± standard error)

Group	One lamb		Twins		Triplets	
	%	viability, %	%	viability, %	%	viability, %
Experimental	$33.33 \pm _{9.07}{}^{a}$	100	$51.85 \pm _{9.61}{}^{a}$	96.43	$14.81 \pm _{6.84}{}^{a}$	93.88
Control	$39.13 \pm _{10.17}{}^{a}$	100	$52.17 \pm _{10.41}{}^{a}$	87.50	$8.69 \pm _{5.87}{}^{a}$	92.31

[a,b] Values in same row marked with different letters in superscript are statistically significantly different ($p<0.05$)

Prolification primarily depends on genetically determined ovulation value for a particular breed of sheep. According to Mitic (1987), prolification values for Romanov breed are between 215 and 300%. Prolification in the experimental group was lower than the controls, although there was no statistically significant difference, which supports the assertion that the the litter size is primarily determined by breed, and to a lesser extent by paragenetic factors. Acheived values of prolification were lower compared to the results of Crosby et al. (2003) and Todini et al. (2007), but were higher than the results acheived by Hussein and al. (2004), Kridli et al. (2006) and Safdarian et al. (2006). To our opinion, differences in acheived values of prolification can be attributed to season in which the estrus was induced and to used breed of sheep.

Displayed distribution of lambs in the litter and the lack of statistical significance of differences between experimental and control can be attributed to characteristics of used sheep breed, which is selected on fertility, and had two, three or more, and only in exceptional cases one lamb in one lambing (Kovnerev and Zamarichev, 1967). This was indicated by the dominance of twins and triplets in the total number of lambs, and a high degree of vitality of lambs, especially those born as triplets. The relatively high percentage of individuals, not characteristic for Romanov breed, can be interpreted by the fact that our study was conducted in deep off-season. Additional factor influencing the number of lambs in the litter was a number of inseminations, which should be two to four times, and, according to Mitic (1987), could increase fertility to 30% more compared to the one-time inseminated dams. This is corroborated by the fact that in our study none of the dams lambed quadruplets

Conclusions

As the conclusion, it can be said that induction and synchronization of estrus in deep off-season can be successfully done with described hormonal treatment, but with necessary preparation of dams by flushing nutrition. Additional treatment with vitamins and minerals has positive effect on parameters of reproductive efficiency in general, but prolificacy would stay within a limits of given breed.

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Received August, 2, 2011; accepted for printing June, 2, 2012.