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THE EFFECT ON FERTILITY OF USING DIFFERENT DOSES OF PMSG IN ANATOLIAN MERINO SHEEP

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Abstract: The objective of this study was to obtain the appropriate dose of PMSG hormone to use in the heat synchronization method during the breeding season of Anatolian Merino sheep. The animal material consisted of 100 heads of Anatolian Merino sheep. Choronogest® sponges containing 20 mg of fluorogestone acetate were applied to all sheep which lasted for 12 days. Then the sponges were removed, and the animals were divided into two groups with equal numbers (n=50). The first group received 300 IU PMSG (application I, n=50) and the second group received 600 IU PMSG (application II, n=50) intramuscularly. Sheep were mated at 96h following the PMSG application. Lambing rate was 94% in the treatment I group and 96% in the treatment II group (P<0.01). Single and twin birth rates were higher in the application II group than in the application I group (P<0.01). The infertility rate was found to be lower in the treatment II group than in the treatment I group (P<0.01). As a result, using 600 IU PMSG hormone in the application of estrus synchronization during the breeding season in sheep ensures better fertility results.

Keywords: Anatolian merino, Heat syncronization, PMSG, Fertility

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1. Introduction

Sheep are among the first domesticated herbivores in human history (Demirsoy, 1989). Sheep breeding is one of the agricultural production branches on which all nations have worked throughout history. For centuries, sheep have been a versatile source of animal production and have an important role in Turkish economy (Gökçen, 2014).

In the sustainability of animal husbandry, it is necessary to keep the fertility rate at the highest level to protect and spread the high-yielding genotypes (Alçam, 2010). Fertility is increased through genetic and environmental breeding. Fertility in sheep, as in other farm animals, is affected by environmental factors such as care, feeding, season, age, live weight, and diseases, as well as the species, race, herd, and individual (Aşkın, 1982; Kaymakçı, 2012; Sen et al., 2021).

Reproduction is accepted as the physiological basis of all animal products. To maximize reproductive potential in sheep breeding; particularly, fertility breeding achieves the goals of increasing the number of lambings per unit time, increasing twinning, and, on the other hand, reaching two lambings per year or three lambings in two years (Eliçin et al. 1986).

Biotechnological methods such as artificial insemination, embryo and semen freezing, heat aggregation, embryo transfer, in vitro embryo production, offspring of the desired sex, increasing the twin rate, cloning, and transgenic animal production technologies are being used to increase animal yield and obtain high-yielding offspring (Emsen and Koşum, 2009; Yılmazer, 2015; Sen and Kuran, 2008).

It is possible to increase sheep fertility and produce lamb meat at any time by stimulating ovarian activity both during and outside of the breeding season by using various exogenous hormones (Aşkın, 1982; Sen et al., 2016). It is critical to support estrus with these hormonal processes in order to supply animal products derived from sheep during market demand periods.

Ovarian activity and plasma concentrations of reproductive hormones are the primary indicators of reproductive performance in sheep (Hafez, 1993). However, an animal's reproductive performance is measured by the rates of estrus, mating, pregnancy, and the number of lambs born following heat synchronization.

While prostaglandins and progestagens are commonly used to regulate estrus, gonadotropins are used to stimulate the ovarian function and provide superovulation (Soydan and Sen, 2013; Sen and Onder, 2016). Gonadotropins are classified into two types: follicle stimulating and ovulatory. The primary gonadotropins for stimulating function is FSH (follicle stimulating hormone) and eCG or PMSG (pregnant mare homone). However, the doses of hormones used in such applications are also of great importance (Jainudeen and Hafez 1987).

The purpose of this study was to determine the effects of

specific doses of PMSG hormone on fertility, which is widely used in heat synchronization applications in sheep.

2. Material and Methods

2.1. Experiment Materials

The animal material of this experiment was 100 heads of yearling Anatolian Merino sheep. All sheep in the experiment were subjected to similar environmental, rearing and feeding conditions under standard breeding conditions, endo- and ectoparasite protection practices were applied initially. Choronogest® sponge containing 20 mg of FGA (Fluorogestone acetate) was applied in the breeding season, individually and lasted for 12 days. The sheep used in the study were split into 2 groups of equal size. The groups received 300 IU (Treatment 1) and 600 IU PMSG (Treatment II) intramuscularly and mating was carried out for 96 hours subsequently. Birth records (single, twin or strile) for each group of animals were collected during the breeding season.

The equations below were used to determine fertility levels in the experimental groups (equations 1, 2, 3, 4, 5, 6 and 4);

Lambing rate: (ewes lambed/ ewes mated) × 100 (1)

Single birth rate: (single-born lambs/ewes born) × 100 (2)

Twins birth rate: (twin-born / ewes born) × 100 (3)

Dead birth rate: (dead-born/ ewes born) × 100 (4)

Infertility rate: infertile ewes/ ewes exposed × 100 (5)

Fecundity: lambs born/ ewes mated (6)

Litter size: lambs born/ number of lambing ewes (7)

2.2. Statistical Analyzes

The percentage data obtained within the scope of the study was transformed. The Minitab 13.0 program was used to perform an analysis of variance on the progeny yield results. Tukey's multiple comparison test was used to compare the means.

3. Results

Table 1 summarizes the fertility results of the study. The lambing rate in the treatment II group was higher than that in the treatment I group ($P<0.01$). However, it was observed that the twin rate was higher in the treatment II group ($P<0.01$). Furthermore, it was determined that the dead birth rate was higher in the treatment II group ($P<0.01$). As a result, 600 IU PMSG applications increased the amount of lamb obtained in the present study. Therefore, it was demonstrated that sheep received 600 IU PMSG to achieve estrus synchronization during the breeding season yielded significantly improved results for fertility.

4. Discussion

Our findings are comparable with the results of Koyuncu et al. (2001) who reported that injection of 700 IU PMSG improved lambing rate, twins' rate, fecundity and litter size. Besides, Koyuncu et al. (2000) reported that the injection of 700 IU PMSG reduced the rate of infertility. In the present study, increasing dose of PMSG resulted in a decrease in infertility rates. According to these findings, we can speculate that a certain increase in the PMSG dose to achieve estrus synchronization may improve fertility in Anatolian Merino ewes. The reason for this improvement is that the PMSG hormone directly stimulates gonadotropin secretion without interfering with melatonin synthesis, allowing sheep to begin reproduction. Emrelli et al. (2003) reported an 87.5% birth rate in Merino sheep when estrus was synchronized using 500 IU PMSG hormone outside the breeding season, whereas we obtained higher results for twins' birth. This improvement in our study could be attributed to the fact that it was conducted during the breeding season. During the breeding season, sheep respond much better to the estrus synchronization program. Depending on the circumstances, the fertility results may improve.

Table 1. Fertility results in various doses of PMSG

Fertility parameters	Treatment 1	Treatment II
Lambing rate (%)	94[a]	96[b]
Infertility rate (%)	6[a]	4[b]
Single lambing (%)	70[a]	56[b]
Twins lambing (%)	22[a]	36[b]
Stillbirth Rate (%)	2[a]	4[b]
Litter Size	1.14[a]	1.28[b]
Fecundity	1.21[a]	1.33[b]

[a,b] The differences between the means shown with different letters in the same line were found to be very significant ($P<0.01$).

4. Conclusion

As a result, 600 IU PMSG application resulted in better fertility in estrus synchronization during the breeding season in Anatolian Merino ewes. Multiple births are particularly important in sheep breeding when the income from lamb sales is considered. Higher-dose PMSG

application has been observed to increase lamb yield by promoting multiple births. Depending on the circumstances, such applications may be used to increase the income from sheep breeding. The amount of income obtained from the increase in lamb yield by using this method is far greater than the costs of doing so. It was concluded that using 600 IU PMSG in estrus synchronization applications during the breeding season increased lamb yield and improved farm income.

Author Contributions

All task made by E.Ş. (100%) data acquisition and analysis, writing up, submission and revision. The author reviewed and approved final version of the manuscript.

Conflict of Interest

The author declared that there is no conflict of interest.

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Ethical Consideration

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to. The experimental procedures were approved by the Local Animal Care and Ethics Committee of Ahi Evran University, Kırşehir, Türkiye, ensuring compliance with directive 86/609/EEC for animal experiments (Date: March 17, 2020, Approve number: 2020/8).

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