INDUCTION OF MULTIPLE BIRTHS IN AKKARAMAN CROSS-BRED SHEEP SYNCHRONIZED WITH SHORT DURATION AND DIFFERENT DOSES OF PROGESTERONE TREATMENT COMBINED WITH PMSG OUTSIDE THE BREEDING SEASON

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Abstract

Determination of the optimal PMSG dose for inducing increased the prolificacy in Akkaraman cross-bred ewes synchronized with the different doses of fluorogestone acetate (FGA) outside the breeding season was the aim of this study. A total of 90 non-lactating ewes were randomly divided into two groups. Vaginal sponges containing 30 mg (group FGA1) and 40 mg (group FGA2) of fluorogestone acetate were inserted into the vagina of the ewes. The sponges were withdrawn on day 7 and 300 IU of PMSG (FGA1A, FGA2A), 500 IU of PMSG (FGA1B, FGA2B) and 700 IU of PMSG (FGA1C, FGA2C) were injected intramuscularly in the named above subgroups of FGA1 and FGA2. Oestrus response, pregnancy, lambing, and multiple birth rates were 100%, 93.3%, 92.8%, 76.9% and 40% in the group FGA1A, 93.3%, 92.8%, 76.9% and 20% in the group FGA2A, 92.8%, 100%, 84.6% and 36.4% in the group FGA2B, 100% 93.3%, 85.7%, 66.7% in the group FGA2C, respectively. Multiple birth rates in the groups FGA1C and FGA2C were significantly higher than in the other groups. In conclusion, the application of 700 IU PMSG was rather more effective than injections of 300 IU and 500 IU in ewes being outside the breeding season.

Key words: Akkaraman ewe, fluorogestone, PMSG, oestrus synchronization, non-breeding season.

Methods to improve reproduction in ewes often aim to increase the proportion of ewes having multiple ovulations, and thereby increase lambing percentage (24). Ovulation rates are increased by injection of gonadotrophins (22) such as human menopausal gonadotrophin (hMG) (6), equine chorionic gonadotrophin (eCG), follicle stimulating hormone (FSH) (17, 20), pregnant mare serum gonadotrophin (PMSG) (7, 23), human chorionic gonadotrophin (hCG) and mixed gonadotrophin preparations (13). Another technique is actively immunizing ewes against androstendione (10), testosterone (3) and oestron (25).

The aim of this study was the determination of the optimal dose of PMSG for inducing increased prolificacy in Akkaraman cross-bred ewes synchronized with different doses of fluorogestone acetate (FGA) outside the breeding season.

Material and Methods

A total of 90 non-lactating ewes (Merinos x Akkaraman crossbred, F1) aging 18-24 months and 6 healthy rams (Merino) aging 2-3 years with a known fertility were used. The study was carried out between May 1 and 31, which is the period accepted as outside breeding season in Konya, Turkey.

The ewes were kept indoors at night and had access to grazing outdoors for most of the day. Indoors, the ewes were fed barley, wheat bran, and wheat straw supplemented with vitamins. Water and mineral licks were available ad libitum.

At first, the ewes were randomly divided into two groups. Vaginal sponges (Chrono-gest, grey sponges, Intervet, Turkey) containing 30 mg of FGA were inserted into the vagina of ewes in the first group (FGA1) (n=45) and vaginal sponges (Chrono-gest, white sponges, Intervet, Turkey) containing 40 mg of FGA were inserted into the vagina of ewes in the second group (FGA2) (n=45). The sponges were withdrawn on
day 7. The ewes, following the withdrawal of the sponges, were divided into three subgroups in each of FGA groups. Each subgroup consisted of 15 ewes. In the subgroups of FGA1 and FGA2, 300 IU (FGA1A, FGA2A), 500 IU (FGA1B, FGA2B), and 700 IU (FGA1C, FGA2C) of PMSG (Folligon, Intervet, Turkey) were injected intramuscularly to all ewes.

After the injections of PMSG, the oestrus cycle of each ewes was followed twice at a 12-h interval using teaser rams. After the detection of oestrus, the ewes were hand-mated. Pregnancy in ewes was determined using the real-time B-mode ultrasound (Scanner 480 Vet, Pie Data Medical, Maastricht, Netherlands) with the 5 MHz linear-array transrectal probe on day 30 following the mating. The number of multiple embryos of each ewe was determined using the transrectal ultrasonography on days 30 and 36 following the mating, as described by Schrick and Inskeep (21).

The following traits were evaluated for each of the treated groups:
- oestrus response (number of ewes showing oestrus/total ewes treated in each group x 100);
- pregnancy rate (number of pregnant ewes/number of ewes showing oestrus and mated in each group x100);
- lambing rate (number of ewes lambing/number of pregnant ewes in each group x 100);
- multiple birth rates (number of multiple lambing/total lambing in each group).

The data were evaluated with chi-square analysis to compare the oestrus response, pregnancy, lambing and multiple birth rates among the groups at the 5% and 1% level of significance (11).

### Results

One of the ewes in the group FGA2B lost its vaginal sponge during the treatment and data analysis did not include this ewe. Oestrus response, pregnancy, lambing, and multiple birth rates in the subgroups were summarized in the Table 1.

There were no statistically significant differences among the groups FGA1A, FGA1B, FGA1C, FGA2A, FGA2B, and FGA2C for oestrus, pregnancy, and lambing rates (P>0.05). But multiple birth rates in the groups FGA1C and FGA2C were significantly higher than in the other groups (P<0.05). There were no significant differences among the groups FGA1A, FGA1B, FGA2A, and FGA2B for multiple birth rates (P>0.05).

### Discussion

Increasing rate of reproduction in sheep offers the best opportunity to increase the efficiency of lamb meat production (15). Methods improving the reproduction often aim to increase the proportion of ewes having twin ovulations, and thereby increase multiple birth percentage (24).

Gonadotrophins are used to induce superovulation in sheep (6). These compounds are administered over the last 2 - 3 d before progestagen sponge removal or injection of prostaglandin to synchronize oestrus (9). PMSG, when injected immediately after the removal of the progestagen sponge, may produce an increase in the rate of ovulation (16, 19).

### Table 1

Oestrus response, pregnancy, lambing, and multiple birth rates

<table>
<thead>
<tr>
<th></th>
<th>Oestrus response (%)</th>
<th>Pregnancy rate (%)</th>
<th>Lambing rate (%)</th>
<th>Multiple birth rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FGA1A</td>
<td>15/15 (100)</td>
<td>14/15 (93.3)</td>
<td>11/14 (78.6)</td>
<td>2/11 (18.2) b</td>
</tr>
<tr>
<td>FGA1B</td>
<td>14/15 (93.3)</td>
<td>13/14 (92.8)</td>
<td>10/13 (76.9)</td>
<td>4/10 (40) b</td>
</tr>
<tr>
<td>FGA1C</td>
<td>15/15 (100)</td>
<td>15/15 (100)</td>
<td>13/15 (86.6)</td>
<td>9/13 (69.2) a</td>
</tr>
<tr>
<td>FGA2A</td>
<td>14/15 (93.3)</td>
<td>13/14 (92.8)</td>
<td>10/13 (76.9)</td>
<td>2/10 (20) b</td>
</tr>
<tr>
<td>FGA2B</td>
<td>13/14 (92.8)</td>
<td>13/13 (100)</td>
<td>11/13 (84.6)</td>
<td>4/11 (36.4) b</td>
</tr>
<tr>
<td>FGA2C</td>
<td>15/15 (100)</td>
<td>14/15 (93.3)</td>
<td>12/14 (85.7)</td>
<td>8/12 (66.7) a</td>
</tr>
</tbody>
</table>

Different superscripts in columns differ significantly; a,b: P<0.05
In our study, the doses of 300 IU (18.2% and 20%) and 500 IU of PMSG (40% and 36.4 %) compared to 700 IU (69.2% and 66.7%) were found to be less effective to induce multiple births. This might be because the dose used in our study was not sufficient to stimulate additional follicular development or weak response of the breed used in this experiment. Regarding this, the use of 500 IU of PMSG at sponge withdrawal was reported to improve the fertility by about 35-70% (2), but the response among different breeds can be varied (12). The multiple birth rates obtained in the groups FGA1C (69.2%) and FGA2C (66.7%) were similar to findings of Bekyürek (2). Romano et al. (19) reported that, PMSG at 250 IU did not increase the fertility or prolificacy rate during the breeding season. Similarly, 300 IU of PMSG did not sufficiently increase the multiple birth rates in our study.

Koyuncu et al. (14) synchronized the Kivrck ewes using pessaries containing progesterone and superovulated them with different doses of PMSG (500 and 700 IU) during breeding season. Prolificacy rates were 158% and 196% in the 500 and 700 IU groups, respectively. The authors demonstrated that progestagen and PMSG treatment increased prolificacy significantly in Kivrck ewes. In this study, FGA + PMSG treatment also provided sufficient synchronization and multiple birth rates.

Öz bey and Tadh (18) synchronized the Awassi ewes for 14 d with sponges containing 40 mg of FGA and superovulated by 500 IU of PMSG injection and oestrus and twinning rates were 100% and 46%. These rates were higher than ours obtained by using 500 IU of PMSG. This difference may be explained by the influence of breed differences on response to the treatment protocol. Also, Karagianmisid et al. (12) reported that response to the different PMSG doses among various breeds was different.

In our study, results in groups FGA1C (100%, 69.2%) and FGA2C (100%, 66.7%) for oestrus and twinning rates were similar to those obtained by Esen and Bozkurt (5) who treated the Akkaraman ewes for 14 d with pessaries containing 40 mg of FGA and injection of 600 IU of PMSG at the time of pessary removal. They reported that the oestrus and twinning rates in breeding season were 94% and 57%, respectively.

Ak et al. (1) treated the Kivrck ewes for 14 d with sponges containing FGA and injected them with 500 IU of PMSG and 500 IU of hCG at pessary removal. Their oestrus and twinning rates were 100 and 90%. The rates were lower in the groups FGA1B and FGA2B than those reported by Ak et al. (1) and this may be due to lack of hCG injection in our experiments. Relevant to this, Çoyan et al. (4) reported that hCG was a good exogenous source of LH to accelerate the ovulation.

In our study, oestrus and pregnancy rates in the groups FGA1A-B and FGA2A-C agreed with those observed by Gökçen et al. (8), who superovulated the Merino ewes with vaginal sponge + 500 IU of PMSG and received 92% oestrus and 85% pregnancy rates.

As a conclusion, the application of 700 IU of PMSG was rather more effective than the administration of 300 IU and 500 IU of PMSG in Akkaraman cross-bred ewes in the breeding season.

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References


