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The Effect of PMSG Hormone Application on Reproductive Efficiency in Different Periods in Kilis Goats together with PGF2α

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ABSTRACT

In this study, a total of 120 does were separated into the designated groups according to the administration of PMSG prior to the second PGF2-alpha ($PGF_{2\alpha}$) injection to obtain an alternative hormone protocol in order to increase oestrous control and reproductive efficiency in Kilis goats. Goats in control group were managed under the breeder's conditions from mating to weaning after birth. Prostaglandin F2-alpha was primed twice with interval of 11-days (on August 11 and August 22, 2017) at 12:00 pm. Pregnant mare serum gonadotropin (PMSG, 500 IU) was injected at 24, 18, 12, 6 and 0-hours prior to the injection of $PGF_{2\alpha}$ to the groups. After the second $PGF_{2\alpha}$ administration, goats in heat were detected by a teaser buck and mated in 12 and 24-hours. The highest twinning rate was obtained in the 12-hour group.

Kilis Keçilerinde PGF2α ile Birlikte Farklı Dönemlerde PMSG Hormon Uygulamasının Üreme Verimliliğine Etkisi

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ÖZET

Bu çalışmada, Kilis keçilerinde östrus kontrolü ve üreme verimliliğini arttırmak amacıyla alternatif bir hormon protokolü elde etmek amacıyla ikinci PGF2-alfa (PGF2α) enjeksiyonundan önce PMSG uygulaması yapılmıştır. Bu amaçla toplam 120 baş Kilis keçisi uygulanmasına için toplam 120 baş keçi biri control grubu olmak üzere 6 gruba ayrılmıştır. Kontrol grubundaki keçiler tamamen yetiştirici koşullarında çiftleştirilmişve herhangi bir hormone uygulaması yapılmamıştır. Diğer tüm hayvanlara Prostaglandin F2-alfa analoğu 11 gün aralıklar ile (11 Ağustos ve 22 Ağustos, 2017) 2 defa uygulanmıştır. İkinci doz PGF2α uygulamasından 24, 12, 18, 6 saat önce ve 2. doz PGF2α uygulaması esnasında 500 IU gebe kısrak hormonu (PMSG) kas içi olarak enjekte edilmiştir. En son hormon uygulamasından sonra kızgın keçiler arama tekesi ile belirlenmiş ve çiftleştirilmiştir. Çalışma sonunda en yüksek ikizlik oranı 2. doz PGF2α uygulamsından 12 saat önce PMSG uygulaması grubunda elde edilmiştir.

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Introduction

The proportion of the goat population in ruminant animals is growing from day to day when compared to other animal species in Turkey (1987-2017). Growing world population and the importance of the nutritional value of goat products are the main reasons in this increase. It is also claimed that goats may have advantages over sheep and cattle in the next years considering global climate changes (Koluman and Silanikove, 2018).

The number of goat breeders tended to increase and many goat farms were established in recent years in Turkey in line with the worldwide trends. Kilis goat is an important gene source of Turkey that adopted to extensive conditions (Gül and Keskin, 2016). A major problem of this system is that bucks are kept in the flock throughout the year in lack of a mating program (Amaranditis et al., 2004; Rahman et al., 2008; Doğan et al., 2008; Karaca et al., 2009; Alexander et al., 2010; Gökdal et al., 2011; Romano et al., 2017). It is possible to synchronize the oestrus with the buck effect and the use of hormones during normal mating season. Various hormones ($PGF_{2\alpha}$, PMSG, eCG, FSH-P etc.) used together or separately for synchronisation in practice for this purpose (Fonseca et al., 2005; İbiş and Ağaoğlu; 2016; Omontese et al., 2016; Sen and Onder 2016). However, no such practices commonly used in goat breeding in Turkey under conditions of extensive breeding system.

This study was carried out on Kilis goats using PGF2α and PMSG combination in order to synchronize oestrus and increase litter size.

Material and Methods

A total of 120 heads of Kilis goats were divided into 6 groups. The first group was (Control) did not receive any hormone, and raised under the traditional mating system. $PGF_{2\alpha}$ (Dinoprost trometamin, 5 mg, IM, Dinolytic, Pfizer) was applied two times to the goats with 11 days interval (day 0 and 11. days) for the rest without considering the groups. PMSG (500 IU) was introduced 24 h (PM24), 18 h (PM18), 12 h (PM12), 6 h (PM6) before second injection of $PGF_{2\alpha}$ and at the same time with the second injection of $PGF_{2\alpha}$ (PM0) in experimental groups (Figure 1).

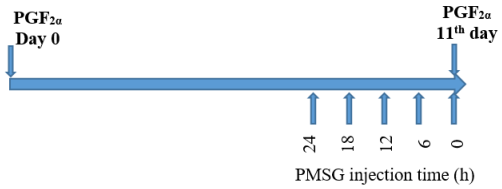

Figure 1. Hormone administration protocol

Teaser buck was left in the flock for the detection of does in heat after second injection of $PGF_{2\alpha}$. The goats in experimental groups were observed at least twice a day and were considered to be in heat when they mated by the buck. Oestrus date and times were recorded for each doe in all groups and one buck was allowed to mate with a maximum of 5 does during joining.

The goats were grazed as a flock during day time and fed with concentrated feed containing 16-18% crude protein and 2600 kcal metabolic energy (ME) in addition to pasture (500 g/day per animal). Water was available before and after the grazing period. Kids were weaned on day 60 and fed with concentrated feed containing 16-18% crude protein and 2600 kcal ME as from two-week age. Data obtained from experiment was analysed using SPSS 22.0 for windows.

Results and Discussion

The effects of hormone administration protocols on estrus synchronisation in experimental groups was shown in Table 1.

The very first average heat was observed in the PM18 group (76.9 hours) and the latest in the PM24 group (104.2 hours) (Table 1). This value was higher in the control than those in the hormone groups (126.9 hours). The earliest time to the first estrus was observed in PM18 (10 hours) and the latest was in PM24 (30 hours) group. The early first estrus time was 50.5 h in Control group ($P<0.05$).

Single, twin and triplet birth rates were calculated according to birth and shown Table 2.

$PGF_{2\alpha}$ and its analogues are available for corpus luteum (CL) regression and estrous synchronization only in breeding season in small ruminants due to their luteolytic properties (İbiş and Ağaoğlu, 2016; Romano et al., 2017; Meidan et al., 2017). Our findings in this study are similar to Greyling and Van Niekerk (1991) and Keskin (2003) findings.

The highest infertility rate was determined in the PM6 and PM0 (40 h and 36 h, respectively), the lowest in the control group ($P>0.05$) and the highest rate of twins was obtained in the PM12 whereas the lowest was in PM0 group ($P>0.05$). When we investigate the effects of hormone protocols on birth type, PM12 group exhibited the highest twin rate (53.8%) and PM0 had the lowest (27.4 %). Triple birth was occurred only in PM24 and PM18 groups, no triplets were yielded in the PM0, PM6 and PM12 groups ($P>0.05$). Survival rate from birth to weaning was shown in Table 2. According to the table, the best survival rate was observed in PM6 group (100%) whereas the worst was in PM12 (92%) group.

PMSG hormone stimulates high expression of FSH and low LH surges in the estrous cycle (Hancı, 2006). With the beginning of the CL regression towards the end of diestrus period, a new graaf follicle begins to form and by the end of this period, the oestrogen released from the developing follicle stimulates the expression of PGF2α and provides regression of corpus luteum (Titi et al., 2010; Saleh, 2011). It is well known that the effects of PMSG hormone on reproductive characteristics in goats. In addition, it has been stated that PMSG administration together with $PGF_{2\alpha}$ increases the yield in different studies. Our data obtained from this study in accordance with the other researchers (Öztürkler et al., 2003; Sözbilir et al., 2006; Ocak, 2007; Yadi et al., 2011; Elmarimi et al., 2015; Sen and Onder, 2016).

Table 1. Average oestrus time in hormone treatment groups (hour)

Groups	***n***	***X̄±Se***	***Min.***	***Max.***
Control	20	126.9 ± 14.3^{b}	50.5	300.0
24 h	20	104.2 ± 8.35^{ab}	30.0	154.5
18 h	19	76.9 ± 8.52^{a}	10.0	144.0
12 h	19	98.7 ± 11.43^{ab}	12.0	176.0
6 h	19	74.9 ± 10.34^{a}	12.0	178.0
0 h	20	100.9 ± 11.00^{ab}	11.0	173.5
P		**<0.05**		
Control	20	126.9 ± 14.3	50.5	300.0
$PGF_{2\alpha}$	97	91.4 ± 4.56	10.0	178.0
P		**<0.01**		
Overall	117	99.1 ± 4.70	10.0	300.0

Table 2. Some reproductive characteristics and effects of hormone protocol on birth type (%)

Characteristics	Control	24 h	18 h	12 h	6 h	0 h	P
Infertility	24.0	28.0	32.0	28.0	40.0	36.0	>0.05
Survival	95.5	95.5	100.0	92.0	100.0	94.4	>0.05
Single	64.3	53.7	66.7	46.2	50.0	63.6	>0.05
Twin	28.6	38.5	25.0	53.8	50.0	27.4	>0.05
Triplet	7.1	7.8	8.3	0.0	0.0	0.0	>0.05

Conclusion

As a consequence, the most intensive synchronization obtained from the hormone protocols was in the PM18 and PM6 groups, which followed by the PM12 and PM0. Infertility rate was high. Therefore, authors claim that the infertile goats should be serviced again to prevent infertility.

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