

Full Length Research Paper

The effect of estrus synchronization on the reproductive characteristics of Turkish Saanen goats and growth characteristics of kids under extensive conditions

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The aim of this study was to determine the effect of oestrus synchronization on the growth characteristics of the Turkish Saanen kids under extensive production. In this study, 70 goats undergoing estrus cycles were synchronized and mated by 10 Turkish Saanen bucks, and together with the produced 124 Turkish Saanen kids, provided the animal material of the study. As a result, 204 animals were used as a material in this study. The estrus cycles of goats were synchronized with intravaginal progestagen sponges impregnated with 45 mg cronolone. Ten day after the application, 0.5 ml prostaglandin F₂ α (PGF₂ α) (İlire®) were injected. After 12 days, sponges were removed and the females received an intramuscular injection 400 IU PMSG (pregnant mare serum gonadotrophin) and each goat was mated by Turkish Saanen bucks. It was observed that the effects of FGA/PGF₂ α /PMSG on fertility and litter size were significant ($P < 0.01$). The mother age was found as significant variable effecting the does weight ($P < 0.01$). Fertility, litter size and weaned rate were found averages of 79%, 1.49 and 81%, respectively. It was also found that birth weight was significantly affected by the birth type and sex while the mother age had no significant effect on the birth weight ($P < 0.01$). The effects of birth type and age on weaning weight were not significant ($P > 0.05$). In conclusion, the use of intravaginal sponges impregnated with 45 mg FGA and 0.5 ml PGF₂ α , in combination, is convenient for estrous synchronization of Turkish Saanen goat in Turkey during the breeding season.

Key words: Estrus synchronization, fluorogestone acetate (FGA), pregnant mare serum gonadotrophin (PMSG), Turkish Saanen goat, fertility, litter size.

INTRODUCTION

Small ruminants in the mating season and the initial time varies to which they are located within the latitude zone. At intermediate and higher latitudes, the breeding season begins when the duration of daylight becomes shorter and ends in winter when the photoperiod is increasing. However, considerable variation exists between goat breeds (Delgado et al., 1991; Mascarenhas et al., 1995;

Amoah et al., 1999; Leboeuf et al., 2003; Zarazaga et al., 2008).

Photoperiod allows by stimulating secretion of hormones, the hypothalamus Gn-RH and pituitary gland LH, effects on reproductive function in the sheep and goats. (Delgado et al., 1991; Malpoux et al., 1994; Greyling, 2000). To increase the fertilization, hormonal effects are used in sheep and goat breeding. The advantage of estrus synchronization is that it is quite significant in small ruminant breeding to produce a single pattern offspring in age and live weight. With this goal, progesterone or its derivatives are widely used.

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Worldwide, the most common administration of progestagen application in goats is via the intravaginal sponge (Tempest and Minter, 1987; Bretzlaff, 1997; Baldassarre and Karatzas, 2004). The most widely used procedures for synchronization and/or the induction of estrous are 12 to 21 days of fluorogestone acetate (FGA) or medroxyprogesterone acetate (MAP) impregnated intra vaginal sponge treatment (Romano, 1996, 1998, 2002; Romano and Benech, 1996; Romano and Fernandez, 1997; Whitley and Jackson, 2004; Romano et al., 2000; Leboeuf et al., 2003) and an intramuscular injection of pregnant mare serum gonadotrophin (PMSG) at progestagen withdrawal (Tempest and Minter, 1987; Greyling and Van der Nest, 2000; Motlomelo et al., 2002), or 11 days treatment with FGA impregnated intravaginal sponges and an intramuscular injection of PMSG and a synthetic prostaglandin F₂ α (PGF₂ α) analogue 48 h before or at sponge withdrawal (Baril et al., 1993; Freitas et al., 1997; Leboeuf et al., 2003). Although some studies have found these two progestagens to be equally effective in the induction of estrus, ovulation and fertility (Smith et al., 1981), some researchers have found some difference between the effectiveness of different types progestagen sponges (Evans and Maxwell, 1987).

Estrus synchronization play a major role in fixed time breeding. The mating season of the goat is between middle of the September and October in Western Mediterranean. In the region, two main factors are significant for an economical sheep and goat breeding. One of these is the condition of the pastures before birth seasons, and the other is the number of weaned kids during the annual amount animal sale seasons.

This trial was performed to test the efficiency of intravaginal progestagen sponges in the synchronization of different age goat, in the natural breeding season and compare the fertility rates.

MATERIALS AND METHODS

Study area

This study was conducted at Suleyman Demirel University, Research and Implementation Areas, province of Isparta in the Western Mediterranean region of Turkey. The study area is located between 37°83'50" to 37°83'31"N latitude and 30°51'72" to 30°51'94"E longitude, at an elevation of 1,250 m. Its aspect is towards the southwest. According to the data provided by the closest meteorology station, Isparta meteorology station, average air temperature is 12.1°C. During the winter (December to March) and summer (June to September) seasons, average air temperature ranges between 1.7 and 5.8 and 19.7 to 23.1°C, respectively (SMSI, 2009).

Animal material

A total of 70 Turkish Saanen does in age from 2 to 5 years, average 38 kg in weight, with the produced 124 Turkish Saanen kids were used for mating 5 Turkish Saanen bucks and 5 teaser bucks in the

trial. As a result, 204 animals were used as a material in the study. Goat flock was sheltered in a semi-open pen. Animals were reared on pasture. The predominant forage species on the natural pasture was *Quercus coccifera*. The does were allowed to graze on natural pasture from 05:30 to 11:30 h and from 16:30 to 21:30 h and kept in pens overnight. Water and a mineral salt lick were provided *ad libitum*. The management of the does did not change throughout the entire experimental period. All animals were raised under similar environmental, nutritional, and management conditions. The newborn kids were weighed and numbered in 24 h. Kids remained with their mother until weaning at three months of age when they were self-fed by the same system of feeding.

Procedure

This study was conducted in Western Mediterranean, during September 2009 under natural conditions. The estrus cycle of the goats were synchronized with intra-vaginal progestogen sponges impregnated with 45 mg cronolone (FGA, Chronogest, Intervet). After 10 day from application were injected 0.5 ml PGF₂ α (Iliren®). Sponges were removed after 12 days and the females received an intramuscular injection of 400 IU PMSG (Folligon, Intervet) and 50 does were mated by each buck. Twenty animals were included in the control group. Bucks were joined back into flocks for non-pregnant goat 15 day later. Birth date, sex, birth weight, weaned weight were recorded. Does started kidding in the second week of February and first week of March. Fertility, litter size and weaned rate, as reproductive features, were all calculated by the method stated by Kaymakçı (2002).

Statistical analysis

Variables, expressed as proportions of goats, were analysed using chi-square analysis. Numbers of kids born were subjected to one-way analysis of variance and differences among treatment groups were tested using Duncan's test. Values were considered to be significant when $P < 0.05$.

RESULTS AND DISCUSSION

According to FGA/PGF₂ α /PMSG administration, does' weight, fertility, litter size and weaned rate were given in Table 1. Age were found to have significant effect on the does weight ($P < 0.01$). The effects of FGA/PGF₂ α /PMSG on fertility and litter size were significant ($P < 0.01$). The group of not synchronized have significantly lower fertility and litter size than the group of synchronized. There was no significant difference in weaned rate. But weaned rate were higher synchronized group. Administration of FGA/PGF₂ α /PMSG significantly increase prolificacy. As it is known, success in applications of synchronization depends on many factors. It can be stated that deviations also occurred among the results obtained from the studies conducted under various conditions. Results confirm the findings of Greyling and Van der Nest (2000) that prostaglandin, as a synchronizing agent, is effective only during the active breeding season by causing luteolysis of the corpus luteum. However, there is a significant delay in the onset of estrus, without FGA.

Table 1. Results of synchronization and reproductive features.

Classification	N	Does weight (kg)	N	Fertility	N	Litter size	Weaned rate
Overall mean	70	38.33±0.96	124	0.79±0.08	70	1.49±0.88	0.81±0.77
Method		NS		*		**	NS
Control		-	51	0.63±0.09 ^a	20	1.42±0.09 ^a	0.73±0.11
FGA/PGF _{2α} / PMSG		-	73	0.84±0.09 ^b	50	1.55±0.09 ^b	0.89±0.11
Age		**		*		NS	NS
2	17	34.23±1.08 ^a	25	0.69±0.07 ^a	14	1.43±0.07	0.79±0.09
3	15	39.72±1.73 ^{ab}	33	0.73±0.13 ^b	17	1.48±0.10	0.84±0.13
5	19	40.23±1.41 ^b	34	0.89±0.13 ^{ab}	20	1.51±0.94	0.81±0.13
> 6	19	38.22±1.67 ^{ab}	32	0.86±0.11 ^{ab}	19	1.53±0.10	0.83±0.14

*P<0.05,**P<0.01; NS: not significant ; a, b: the differences among the averages indicated with different letters in a factor are significant (P<0.05).

Priming with FGA before the administration of PGF_{2α} influenced not only the onset, but also the duration of the induced estrous period. In a study of 45 mg intravaginal FGA was adequate to suppress estrous activity, confirming that progestagen has the ability to inhibit estrus in goats (Romano, 1998). Administration of 400 IU PMSG during the breeding season, failed to demonstrate a significant positive effect not only on the onset and duration of the induced estrous but also on fertility and prolificacy obtained. The aforementioned indicate an adequate surge of endogenous gonadotrophin to initiate the hormonal events leading to estrus and ovulation. It must be mentioned that PMSG treatment, required to induce estrus in goats (Amarantidis et al 2004) during the non-breeding season, shortens the interval from the cessation of progestagen treatment to the onset of estrus.

The effect of age on fertility were significant in this study (P<0.05). The effect of age on fertility in goats and sheep are known to be significantly effective. Generally, the offspring yield is lower than in the first year (Hafez, 1980b). In this study, the litter size of 1.49 was similar in all treatments, of PMSG administration. In contrast, Zygoyiannis et al. (1989) recorded prolificacy of 2.0 in synchronized does of the different breed (*Capra prisca*). This prolificacy was higher than that of 1.49 recorded. Amarantidis et al. (2004) recorded prolificacy of 1.2 in synchronized does of the different breed (*C. prisca*). This difference might have aroused from different age groups and breeds. In this study, administration of synchronization on weaned rate was not significant, but there was a significant difference between groups (73 and 89%). The effect of weaned rate was observed the highest in kids especially which have mother age at 3 years old.

The result on birth type, sex and mother age, birth weight and weaning weight of Turkish Saanen kids are given Table 2. Birth type (single, twins, triplets) and sex

were significantly affected by the birth weight (P<0.01), but the age of dam was not significant. Twins or triplets tended to have lower birth weights. Birth weight of kids in single, twin and triplets were 3.91, 2.96 and 2.18 kg, respectively. This is higher than the birth weight stated by Şimşek et al. (2007), but similar to the finding of Amoah et al. (1996). Birth weight and weaning weight of males is more than females. This situation may be the result of males benefiting more from pasture than females. The effects of birth type and age on weaning weight were not significant (P>0.05). Among the mother age groups, the lowest performance was observed among the 6 years old or older. Weaning weight of 90-day old kids in single, twin and triplet was 19.76, 17.04 and 17.84 kg, respectively. This is consistent with the findings of Freitas et al. (2004) for Saanen kids (17.4 kg) and Koşum et al. (2004) for Saanen, Bornova and Saanen × Kilis kids, and higher than the findings of Mavrogenis et al. (1984) for Damascus kids (16.77 kg). The effect of synchronization was not significant.

Conclusion

In conclusion, the use of intravaginal sponges impregnated with 45 mg FGA and 0.5 ml PGF_{2α} combined is convenient for estrus synchronization in Turkish Saanen goat in Turkey during the breeding season. Synchronization application is necessary, because of a significant positive effect on estrus and fecundity. It is clear that more advantageous with respect to the offspring and weaned can be achieved through estrus synchronization than the conventional production methods according to the study. In order to improve the maintenance and feeding conditions in farms will provide a more beneficial production by influencing the development of the offspring and the survival rate. According to the breeders, determination of the most suitable birth

Table 2. Birth weight and weaning weight of Turkish Saanen kids.

Classification	N	Birth weight (kg)	Weaning weight (kg)
Group		NS	NS
Control	32	3.20±0.10	19.61±0.94
FGA/PGF ₂ α / PMSG	87	3.47±0.13	19.21±1.23
Birth type		**	NS
Single	69	3.91±0.12	19.76±1.12
Twin	37	2.96±0.13	17.04±0.54
Triplet	13	2.18±0.11	17.84±1.42
Sex		**	**
Female	58	3.24±0.11	18.75±0.78
Male	61	3.50±0.11	19.98±1.05
Mother age		NS	NS
2	17	3.45±0.11	17.80±0.90
3	15	3.48±0.16	18.87±1.29
5	19	3.62±0.16	18.08±1.16
>6	19	3.08±0.17	19.10±1.19

*P<0.05, **P<0.01; NS: not significant; a, b: the differences among the averages indicated with different letters in a factor are significant (P<0.05).

time was provided from the highest level of profitability.

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