



Synchronization of Ovulation and Fixed Time Breeding in Tellicherry Goats

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10.18805/IJAR.B-5375

ABSTRACT

Background: Reproductive management of goats on large scale becomes difficult due to contributing reasons like poor estrus expression, lack of heat detection techniques, etc. Synchronization of ovulation has significantly improved the conception in cows. However, such investigations are lacking in goats. Hence, an experiment was conducted to compare the efficacy of different ovulation synchronization protocols on kidding and fecundity rates in Tellicherry goats during winter and summer seasons.

Methods: The study was conducted in 240 does of 60 days postpartum period in two different seasons and investigated the efficacy of different protocols. The efficacy of intravaginal sponge (group I), Ovsynch (group II), Ovsynch with sponge (group III), Co synch (group IV), Co synch with sponge (group V) and control (group VI) on kidding and fecundity rate following fixed time breeding (NS/AI) was investigated in Tellicherry goats.

Result: The overall kidding rate recorded during winter season in natural service (NS) was 80.00 and Artificial Insemination (AI) it was 70.00 per cent and in summer season it was 60.00 and 55.00 per cent, respectively. During winter season the fecundity rates observed were 1.70, 1.60, 1.75, 1.60, 1.60 and 1.40 in group I, II, III, IV, V and VI, respectively. The corresponding values during summer season were 1.55, 1.40, 1.60, 1.45, 1.50 and 1.10, respectively. From this study, the ovsynch with intravaginal sponge protocol found to be an effective protocol for ovulation synchronization in Tellicherry goats.

Key words: Fecundity, Ovsynch, Ovulation, Progesterone, Synchronization.

INTRODUCTION

Goats were the first species domesticated by humans for the production of meat, milk, skin and fibre. It can be found in a wide range of climates and are managed using a variety of husbandry techniques (Boyazoglu *et al.*, 2005). India supports 27.8 per cent of the world goat population (FAO Statistics, 2023), making it among the 2nd largest population of goats in the world. Based on the latest G_oI statistics (20th Livestock Census, 2019), the number of sheep and goats in the country is 74.26 and 148.88 million, respectively.

There is increased demand for the goat meat in the Asian subcontinent because of enormous human population. So, an efficient animal production system is highly essential to ensure food security. The growth of goat production has intensified in recent decades, especially in developing countries, which hold the largest flocks. Goats are polyestrous they do not express clear estrus signs. During summer season, the estrus behavioural expression is notably Therefore achieving uniform kidding throughout the year is not possible solely relying natural estrus (Pietroski *et al.*, 2013). Worldwide, Progesterone or progestogen analogue is commonly used for estrus synchronization in does during the breeding and non-breeding seasons (Ak *et al.*, 1998).

Synchronization of ovulation is the process by which the reproductive cycle of an animal is manipulated by the use of hormones or their analogues to induce ovulation at a precise point of time. The first synchronization of ovulation treatment for cows, as it is known today, was developed by Pursley *et al.* (1995). The Ovsynch protocol includes 4 µg GnRH analogue injection was given intramuscular on

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How to cite this article: Senthilkumar, K., Selvaraju, M. and Daisy, M. (2025). Synchronization of Ovulation and Fixed Time Breeding in Tellicherry Goats. Indian Journal of Animal Research. 59(5): 737-740. doi 10.18805/IJAR.B-5375.

Submitted: 03-04-2024 **Accepted:** 05-06-2024 **Online:** 22-07-2024

day 0, followed by an intramuscular injection of 3.75 mg Synthetic PGF_{2α} seven days later. A second injection of 4 µg GnRH analog was administered on day 9 and fixed time breeding at 16 hours after second GnRH Injection (Holtz *et al.*, 2008). Synchronization of ovulation coordinates follicular development, luteal regression and ovulation in all treated females concomitantly. This allows artificial insemination to occur at a fixed time without any need for estrus detection (Pursley *et al.*, 1995).

Multiplication of indigenous breed like Tellicherry breeds using ovulation synchronization in conjunction with artificial insemination (AI) is necessary for sustainable goat

production (Selvaraju *et al.*, 2003). Hence, manipulating the estrous cycle, regardless of the season, would be beneficial for artificial insemination (AI) and achieving a uniform kidding rate throughout the year. Several studies in bovines revealed that the pregnancy rates in Ovsynch and Co-synch program is higher than in control group. Since, no such studies were found in Tellicherry breed. The present investigation has been undertaken in Tellicherry goats.

MATERIALS AND METHODS

A total of 240 pleuriparous does which had completed 60 days post-partum in organised goat farms in and around Veterinary College and Research Institute, Namakkal were taken in this study. Out of 240 does, 120 does were selected during winter season (from October to January) and the remaining does were selected during summer season (from April to July). The selected does of each season were randomly and equally divided into six experimental groups viz., Groups I, II, III, IV, V (Treatment groups) and VI (Control group) (Table 1) and hence, each group consisted of 20 does. All the does in both seasons were equally subject to fixed time breeding by NS or AI during the year 2020-2021.

Parameters studied

The kidding rate (%) is calculated by total number of does kidded divided by number of does treated in each group and expressed in percentage. The fecundity rate is calculated by number of kids born divided by number of does kidded in each group and expressed in number.

Statistical analysis

All the values obtained were expressed as the mean $\pm$ standard error of the mean. The kidding and fecundity rate were analyzed using Student's t-test (SPSS version 20.0). The statistical level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Kidding rate

In the current study, the kidding rate in vaginal sponge group (group I) during winter and summer season were 60.00

and 55.00 per cent (Table 2). It was similar to the kidding rate obtained in control group (group VI). Similar kidding rate was recorded by Simoes (2015) and Inwati *et al.* (2022) in goats. The results of the present study indicated that intravaginal sponge effectively controlled the estrus and fixed time breeding resulted in improved kidding rate as indicated by Selvaraju and Kathiresan (1999) in Malabari goats.

During the winter and summer season the ovsynch treated groups (group II) exhibited 75.00 and 65.00 per cent kidding rate, at respective seasons. Holtz *et al.* (2008). In ovsynch treated groups, Inwati *et al.* (2022) and Panicker *et al.* (2015) recorded 58 per cent kidding rate. The increased kidding rate in this experimental group might be related to the start of protocol during early to mid-diestrum (Vasconcelos *et al.*, 1999). The ovsynch protocol when started during mid diestrus, the pregnancy rates were higher because of higher incidences of ovulation after the first GnRH injection (Cartmill *et al.*, 2001).

In the current experiment, during winter and summer season the overall kidding rates in ovsynch with vaginal sponge group (group III) were 80.00 and 70.00 per cent, respectively. Nur *et al.* (2013) reported 24.00 per cent kidding rate following ovsynch plus sponge treatment in nulliparous Saanen goats. In this study, among all the groups, ovsynch with sponge groups (group III) obtained the highest kidding rate. The continuous release of progesterone from vaginal sponge between first GnRH and PGF₂ α injection may have prevented premature estrus, LH surge and ovulation (El-Zarkouny *et al.*, 2004). Hence, inclusion of intravaginal sponge in ovsynch protocol in Tellicherry goats increased the kidding rate in both the seasons.

In this investigation, during winter and summer seasons 70.00 and 60.00 per cent kidding rate was achieved in co-synch treatment (group IV). However, Carba and Velicevici (2013) obtained 57.00 per cent pregnancy rate in cows treated with co-synch treatment. The result of the study indicated that Co-synch protocol proved to be effective in increasing the kidding rate when compared to control goats.

In group V of this study, the overall kidding rate in winter and summer season was 75.00 and 65.00 per cent,

Table 1: Experimental group.

Name of the groups	Day 0	Day 7	Day 8	Day 9	Breeding
Group-I (Vaginal sponge)	Insert intravaginal Sponge		250 μ g of PGF ₂ α	300 IU eCG	60 hrs after removal of sponge NS/AI
Group-II (Ovsynch)	10 μ g of GnRH	250 μ g of PGF ₂ α		10 μ g of GnRH	16-18 hrs after GnRHNS/AI
Group-III (Ovsynch + Vaginal sponge)	Insert intravaginal Sponge+10 μ g of GnRH	250 μ g of PGF ₂ α		10 μ g of GnRH	16-18 hrs after GnRHNS/AI
Group-IV (Co-synch)	10 μ g of GnRH	250 μ g of PGF ₂ α		10 μ g of GnRH	On Day 9 NS/AI
Group-V (Co-synch + Vaginal sponge)	Insert intravaginal Sponge +10 μ g of GnRH	250 μ g of PGF ₂ α		10 μ g of GnRH + NS/AI	At the time of Second GnRH Injection (Day 9)
Group-VI (Control)	Breeding based on estrus signs. NS/AI				

respectively. Nur *et al.* (2013) stated that the kidding rate following co-synch plus sponge treatment in Saanen goats was 38.00 per cent only. In co-synch protocol inclusion of the intravaginal sponge improved the kidding rate as that of ovsynch plus sponge group in this study. Administration of second GnRH 16-18 hours prior to breeding in ovsynch protocol might have stimulated LH surge appropriately and it might have followed by the fixed time breeding to increase the kidding rate as described by Holtz *et al.* (2008).

The natural service in groups I to VI resulted in 80.00 and 70.00 per cent overall kidding rate in winter and summer season. In both seasons in all the groups including control group natural service resulted in higher overall kidding rate than artificial insemination. It indicated that the method of breeding following synchronization of ovulation influenced the kidding rate. In general, natural service group of all synchronized and control groups showed higher percentage of kidding rate when compared to artificial insemination groups. Ritar and salmon (1983) and Ritar *et al.* (1990) attributed the lesser conception rate in goats with AI to the sperm concentration in the semen used for AI and problem with the transport of frozen-thawed spermatozoa through the reproductive tract of the goat.

In the current investigation the overall kidding rate during winter and summer in Tellicherry does was 70.00 and 61.66 per cent, respectively. All the groups including control had higher kidding rate during winter than summer. It was evident that the kidding rate following synchronization of estrus /ovulation was influenced by the seasonal factors. In this study, during winter season, the increased overall kidding rate would be related to the availability of green fodder (Ahamad *et al.*, 2014), cool environment and absence of heat stress (Mellado and Meza-Herra, 2002).

Fecundity rate

In this study, there was a marked improvement in the fecundity rate in all the treated groups when compared to the control group in both the seasons (Table 2). In the treatment groups the fecundity rate ranged from 1.6 to 1.75 per doe in winter and 1.40 to 1.60 in summer season. These results were in agreement with those of Bretzlaff and Madrid (1989), Selvaraju and Kathiresan (1999) and Nasroallah *et al.* (2012) in goats treated with synchronization of estrus/ovulation protocols. However, Nur *et al.* (2013) reported the fecundity rates as 1.2 and 1.4 in ovsynch plus sponge and co- synch with sponge treated goats respectively. The results of the present study clearly indicated that all the synchronization of ovulation protocols followed in this study regularized the ovulation and their timings in relation to the fixed time breeding and it might be the reason for increased fecundity rate in treated groups (Holtz *et al.*, 2008). Among the treated groups, the ovsynch with sponge (group III) in winter and summer seasons had the maximum fecundity rate in this study. Injection of GnRH prior to breeding and inclusion of progesterone between first GnRH and PGF₂α injection might have caused closer synchrony of ovulation and resulted in increased fecundity rate in this group (Nur *et al.*, 2013).

The overall fecundity rate in summer and winter was 1.43 and 1.60 per doe. It indicated that increased serum cortisol levels during summer might have affected the ovulation response or might have caused early embryonic death (Khan and Ludri, 2002). These observations were attributed to the reduction in number kids produced during summer.

Table 2: Kidding and fecundity rates following synchronization of ovulation in winter and summer seasons.

Treatment groups	No of does treated		Kidding rate (per cent)			Fecundity rate		
			Natural service (NS)	Artificial insemination (AI)	Overall	No of does kidded	No of kids born	No of kids per doe
Winter season (October to January)	Group-I	20	80.00 (8/10)	40.00 (4/10)	60.00 (12/20)	12	20	1.70
	Group-II	20	80.00 (8/10)	70.00 (7/10)	75.00 (15/20)	15	24	1.60
	Group-III	20	90.00 (9/10)	70.00 (7/10)	80.00 (16/20)	16	28	1.75
	Group-IV	20	80.00(8/10)	60.00 (6/10)	70.00 (14/20)	14	22	1.60
	Group-V	20	80.00 (8/10)	70.00 (7/10)	75.00 (15/20)	15	24	1.60
	Group-VI	20	70.00 (7/10)	50.00 (5/10)	60.00 (12/20)	12	17	1.40
Overall		120	80.00 (48/60)	60.00 (36/60)	70.00 (84/120)	84	135	1.60
Summer season (April to July)	Group-I	20	60.00 (6/10)	50.00 (5/10)	55.00 (11/20)	11	17	1.55
	Group-II	20	70.00 (7/10)	60.00 (6/10)	65.00 (13/20)	13	18	1.40
	Group-III	20	80.00 (8/10)	60.00 (6/10)	70.00 (14/20)	14	22	1.60
	Group-IV	20	70.00 (7/10)	50.00 (5/10)	60.00 (12/20)	12	17	1.45
	Group-V	20	70.00 (7/10)	60.00 (6/10)	65.00 (13/20)	13	19	1.50
	Group-VI	20	60.00 (6/10)	50.00 (5/10)	55.00 (11/20)	11	12	1.10
Overall		120	70.00 (42/60)	55.00 (33/60)	61.66 (74/120)	74	105	1.41

Group I- Vaginal sponge, Group II- Ovsynch, Group III- Ovsynch+sponge, Group IV- Co-synch, Group V- Co-synch+sponge, Group VI- Control.

CONCLUSION

Based on the findings of the investigation, it was concluded that synchronization of ovulation with ovsynch plus intravaginal sponge in both seasons is the most effective protocol for increasing the kidding and fecundity rates in Tellicherry goats. However, with a greater number of does in the trial is recommended for further research.

ACKNOWLEDGEMENT

The authors acknowledge sincere thanks to the Dean, Veterinary College and Research Institute, Namakkal, TANUVAS, Tamil Nadu for providing necessary facilities to carry out the work.

Conflict of interest

All authors declare that they have no conflict of interest.

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