



Oestrus induction efficacy of injectable and intravaginal progesterone-based protocols in postpartum Malabari goats[#]

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Abstract

The study was aimed to evaluate the efficacy of injectable progesterone and intravaginal progesterone-based protocols incorporating hCG for oestrus induction in postpartum Malabari goats. The experiment was conducted in 14 Malabari goats on day 60 postpartum. Reproductive performance following the treatment was assessed based on parameters like oestrus response, onset of oestrus, duration of oestrus, time of artificial insemination (AI), and the number of animals conceived. The oestrus response was 100 per cent in both the groups. The mean time taken for the onset of oestrus (53.36 ± 6.78 h-injectable; 41.57 ± 4.99 h-intra vaginal), duration of oestrus (33.36 ± 2.09 h- injectable; 33.71 ± 2.13 h-intra vaginal) and the mean time of AI (69.64 ± 7.09 h-intra vaginal; 56.71 ± 4.18 h- injectable) did not differ significantly between the groups. The conception rate was 71.43 per cent (5/7) and 57.14 per cent (4/7), respectively in injectable and intravaginal progesterone groups with no significant difference between the groups ($p>0.05$). The study revealed that, both injectable progesterone and intravaginal progesterone protocols were effective in inducing oestrus in postpartum Malabari goats.

Keywords: Oestrus induction, postpartum, conception, progesterone, Malabari goats

Postpartum anoestrus in goats refers to a period of reproductive inactivity or delay in return to oestrus following parturition, often extending the inter-kidding interval and affecting farm profitability. The onset of the first oestrus after weaning in Malabari crossbred does ranged from 48 to 72 days postpartum (Upasana *et al.*, 2016). Factors such as nutrition, season, and nursing influence the resumption of ovarian activity (Takayama *et al.*, 2010). While traditional hormonal protocols involving intravaginal progesterone sponge can effectively induce oestrus, the use is limited under field conditions due to practical challenges like vaginitis, purulent vaginal discharge upon the removal of sponges, adhesion to the vaginal wall and bleeding. To overcome these issues, alternative protocols using single or multiple injectable progesterone have been developed. This study aims to evaluate the efficacy of injectable and intravaginal progesterone-primed protocols for oestrus induction in postpartum Malabari goats.

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The experiment was conducted in 14 postpartum Malabari goats maintained under identical management conditions at University Goat and Sheep Farm, Mannuthy under Kerala Veterinary and Animal Sciences University. Weaning was done on day 55 postpartum and treatment was initiated on day 60 postpartum. Animals were housed in well-ventilated sheds and had access to natural pastures during day hours. Daily feeding allowance was according to ICAR (2013) standards, and ad libitum water was provided. Trans-rectal ultrasonography (TRUS) was carried out to rule out pregnancy, uterine pathologies and to assess the ovarian status before the selection of animals. Reproductive ultrasonography was done using a real time scanner (MyLab Gamma, EsaoteSpA, Italy) equipped with 5-10 MHz frequency linear array transrectal transducer (SV3513, EsaoteSpA, Genova, Italy).

The animals were randomly allotted to two groups, G1 and G2. In G1, oestrus induction was carried out using three injections of progesterone (Susten™ 25 mg, IM) on alternate days (days 0, 2, 4) followed by an intramuscular injection of 125 µg of PGF_{2α} (Cloprostenol, Estrumate, Intervet, Holland) on day 6. The animals were artificially inseminated (AI) using chilled semen on detection of oestrus. On the same day, 250 IU of human chorionic gonadotropin (hCG) (Chorulon®, Intervet, Holland) was administered intramuscularly. In G2 group, on day 0 (the start of the experiment), an intravaginal progesterone sponge containing 350 mg of natural progesterone (AVIKESIL-S, ICAR-Central Sheep and Wool Research Institute, Avikanagar) was inserted. On day six, the sponge was removed, and an intramuscular injection of 125 µg of PGF_{2α} was administered and injection of 250 IU hCG was administered along with AI on detected oestrus. Oestrus detection was performed using an apronised buck twice daily for 30 minutes, 24 h following PGF_{2α} injection. Artificial Insemination was done on detected oestrus using 0.25 mL of chilled extended buck semen (1:10 dilution, 400 million spermatozoa/mL) by speculum method. Re-insemination was performed 24 h later in animals when oestrus signs persisted. Pregnancy diagnosis was carried out on the 30th day following AI using TRUS.

The oestrus response in the experimental groups was calculated as the per cent of animals that exhibited oestrus to the total number of animals that underwent hormonal treatment. The oestrus onset was observed from 24 h of PGF_{2α} injection using a buck and was defined as the midpoint between the last instance of rejection and the first instance of acceptance of buck by the doe (Holtz *et al.*, 2008).

The duration of oestrus was determined by measuring the interval from the onset to the cessation of behavioural and physiological signs of oestrus. The midpoint between the final instance of acceptance and the first instance of rejection of buck by the doe was marked as the end of oestrus (Holtz *et al.*, 2008). The time of AI was

calculated as interval from the day of PGF_{2α} administration to AI on detected oestrus in both the groups and the conception rate was calculated as the number of animals conceived to the total number of the animals underwent hormonal treatment, expressed in per cent. The data obtained were analysed using SPSS version 24.0.

The oestrus response was 100 per cent in both the groups (Table 1). The results obtained in the G2 group was consistent with the findings of Gore *et al.* (2020) and Karaca *et al.* (2010), who reported a 100 per cent oestrus response rate using the CIDR and eCG protocol in Toggenburg dairy goats and Hair goats, respectively. The oestrus response in the G1 group was higher than the observation by Dehkordi *et al.* (2022). They obtained an oestrus response rate of 81.80 per cent during the non-breeding season in Karakul ewes following injectable progesterone-primed protocol with hCG. The difference in oestrus response with the present study might be attributed to breed, season and ovarian status at the start of treatment. The higher oestrus response with this protocol might be due to supra luteal levels of progesterone in short-term progesterone primed protocols that enhance the follicular turnover and increase the number of young, healthy follicles with the ovulatory potential (Karaca *et al.*, 2010; Gore *et al.*, 2020).

The mean time taken for the onset of oestrus did not differ significantly between the treatment groups (Table 1). The mean time taken for the onset of oestrus in G1 group was 53.36 ± 6.78 h (27 to 84h). The result obtained was in agreement with the study of Dehkordi *et al.* (2022), who observed the oestrus onset from 48 to 72 h after hCG administration in Karakul ewes (primed with three doses of progesterone injection every other day and hCG 24 h after the last injection) during the breeding as well as in the non-breeding season.

The mean time taken for the onset of oestrus in G2 group was 41.57 ± 4.99 h (26 to 63.5 h), which was in agreement with Fonseca and Torres (2005), who reported an oestrus onset of 46.10 ± 15.00 h for medroxy progesterone acetate (MAP) treated Toggenburg goats. Additionally, Fonseca *et al.* (2005) observed a similar time of 46.20 ± 8.40 h in dairy goats treated with CIDR and hCG.

The mean duration of oestrus did not differ significantly between the treatment groups (Table 1). The mean duration of oestrus in G1 group was 33.36 ± 2.09 h (24 to 40 h). Alvarado-Espino *et al.* (2016) reported an oestrus duration of 33.60 ± 5.00 h in Alpine goats treated with a single injection of progesterone and hCG. The mean duration of oestrus in G2 group was 33.71 ± 2.13 h (24 to 41 h). The results were consistent with the findings of Gore *et al.* (2020) and Hameed *et al.* (2020) who reported an oestrus duration of 31.70 ± 0.52 h in Toggenburg goats and 32.20 ± 1.24 h in anoestrus Beetal goats, respectively,

Table 1. Reproductive parameters of postpartum Malabari goats treated with injectable and intravaginal progesterone-based protocols for oestrus induction

Parameters	G1 (Injectable progesterone) (n=7)	G2 (Intravaginal progesterone) (n=7)	p value
Oestrus response (%) (N=14)	100	100	-
Time taken for the onset of oestrus (h) (Mean \pm SE)	53.36 \pm 6.78	41.57 \pm 4.99	0.96 ^{ns}
Duration of oestrus (h), (Mean \pm SE)	33.36 \pm 2.09	33.71 \pm 2.13	0.99 ^{ns}
Time of AI (h), (Mean \pm SE)	69.64 \pm 7.09	56.71 \pm 4.18	0.80 ^{ns}
Conception rate (%)	71.43	57.14	0.69 ^{ns}

^{ns}Not significant at 5% level ($p \geq 0.05$)

following a seven-day CIDR protocol with eCG. The present study was also in agreement with Krishnakumar (1992), who reported that the average duration of natural oestrus in Malabari goats ranged from 30 to 40 h.

The mean time of AI did not differ significantly between the treatment groups (Table 1). The mean time of AI in G1 group was 69.64 \pm 7.09 h (48 to 96 h), which was in agreement with Alvarado-Espino *et al.* (2019), who observed the time of AI in injectable progesterone protocols as 60 to 72h in European dairy breeds of goats. The mean time to AI in G2 group was 56.71 \pm 4.18 h (39.5 to 72 h). These findings align with observations of Fonseca *et al.* (2017), who reported that the optimal time for performing fixed-time AI (FT-AI) in short-term (6-day) oestrus induction protocols was 55 h after progesterone sponge removal in dairy goats.

The conception rates did not differ significantly between the treatment groups (Table 1). The conception rate observed in the G1 group was 71.43 per cent. This rate was higher than that reported by Dehkordi *et al.* (2022), who obtained a conception rate of 57.6 per cent using multiple progesterone injections with hCG in Karakul ewes. While the conception rate in the G2 group was 57.14 per cent, which was comparable to the findings of Pietroski *et al.* (2013), who reported a 60 per cent conception rate using a 6-day intravaginal progesterone sponge with hCG, and Fonseca *et al.* (2009), who achieved a 57.1 per cent conception rate in Anglo-Nubian goats with a 6-day CIDR protocol with hCG.

Summary

The study evaluated the effectiveness of injectable and intravaginal progesterone-primed protocols for oestrus induction in postpartum Malabari goats. The results revealed 100 per cent oestrus response in both the protocols with a conception rate of 71.43 and 57.14 per cent in injectable and intravaginal progesterone protocols, respectively. The protocols also did not vary significantly with respect to onset of oestrus, duration of oestrus and time of AI in Malabari goats. Hence, it can be concluded that, both protocols are equally effective in inducing

oestrus. Considering the limited availability of progesterone sponges and the practical challenges of using them under field conditions, the injectable progesterone protocol is a promising alternative for inducing oestrus in postpartum Malabari goats.

Conflict of interest

The authors declare that they have no conflict of interest.

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