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Fertility after induction of oestrus in anoestrus Jamunapari goats primed with progesterone and eCG treatment

A K GOEL[1] and S D KHARCHE[2]

Central Institute for Research on Goats, Makhdoom, Farah, Mathura, Uttar Pradesh 281 122 India

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ABSTRACT

Present study was aimed to improve upon life time productivity in adult anoestrus goats (24; 18 parous and 6 non – parous) to resume oestrus cyclicity by hormonal intervention (treatment group, 16; control group, 8). Prior to start of treatment all goats were checked for luteal activity by estimating circulating progesterone (P_4). Goats were implanted @ half crestar implant/goat (1.5 mg norgestomet) subcutaneously and left *in situ* for 15 days. Concurrently, 1 ml of crestar solution (1.5 mg norgestomet and 2.5 mg oestradiol valerate) was administered to each goat**.** A luteolytic dose (7.5 mg) of illiren was intramuscularly injected to each goat 24 h prior to implant removal to regress functional luteal tissue, if any. Implants were taken out after 15 days and an amount of 400 – 500 IU eCG/goat was intramuscularly injected to stimulate follicular growth. At induced oestrus each goat received 2.5 ml receptal to enhance ovulation. Goats at induced oestrus were naturally mated twice at 10 – 12 h interval by fertile Jamunapari bucks. Responded does (14 goats, 87.50%) expressed behavioral symptoms of oestrus varying from medium to high intensity. Post treatment oestrus induction period and duration averaged 34.28±3.29 and 29.14±2.07 h, respectively. Progesterone level prior to start of hormonal protocol was at basal level ($P \leq 1.00$ ng/ml). A total of 9 goats (65.00%) were confirmed for pregnancy by progesterone assay (14 and 21 days after mating) and real time B- mode ultrasonography at 40 – 60 days of gestation. The kidding rate was 1.88. It is concluded that oestrus can be induced and synchronized in anoestrus (parous and non – parous) by hormonal intervention. It is also possible to augment fecundity in this important but less explored goat breed of India.

Key words: Anoestrus, Ear implant, eCG, ELISA, Jamunapari goat, Kidding rate, Post-partum, Progesterone, Real time B mode ultrasonography

Jamunapari goat breed of India has been used as improver breed for enhancing milk production in indigenous goat breeds of South east Asia and Indian subcontinent including Nepal and Bangladesh (Roy and Pant 2001). The length of the post-partum ovarian cyclicity is influenced by a variety of factors, viz. breed, lactation, season of kidding (Restall 1991, Neeru *et al.* 2003), parity (Singh *et al.* 1986), litter size (Simplicio *et al.* 1982, Goel and Agrawal 1998), sex (Goel and Agrawal 1998), level of nutrition after kidding (Westerman *et al.* 1982) and reproductive problems (Goel and Sinha 2005). Interventions are possible for shortening of post-partum oestrus. Research findings suggest that to induce oestrus behavior in sheep and goats, prior conditioning of neural centers with progesterone is necessary. Therefore, a progestagen/prostaglandin combination associated with low doses of eCG was found effective in goats with more than 60% goats kidding after AI with frozen thawed semen at a predetermined time (Baril and Saumande 2000). Kidding rate may further increase if prolific goat breeds are put under hormone therapy. The eCG (PMSG) is a hormone of choice considering its affordable cost and easier availability (Ritar *et al.* 1989, Leboeuf *et al*. 1994). This study was undertaken to evaluate the efficacy of progestogen – eCG combination in inducing ovulatory oestrus and improving kidding performance (fecundity) in Jamunapari goats.

Present address: [1]Principal Scientist (anil@cirg.res.in), [2] Senior Scientist (kharche62@gmail.com), Physiology, Reproduction and Shelter Management Division.

MATERIALS AND METHODS

Jamunapari goats (18 parous, 6 non-parous), 3 – 5 years old; body weight, 40.00 kg to 57.00 kg, which were in anoestrus for a period ranging from 6 to 12 months were taken for the present investigation. Goats under study were divided in 2 groups i.e. group 1 (treatment) comprised 16 anoestrus animals. Goats under treatment group were administered with a hormonal protocol for resumption of ovarian activity and recording of kidding rate. Group 2 (control) comprised 8 goats. Animals under control group were not administered hormones and observed for the

occurrence of oestrus during the experimental period. Animals under study were maintained under intensive system of management. Goats were offered concentrate mixture @400g/animal/day along with wheat and gram straw *ad lib.* and greens @500g/animal/day as per their seasonal availability. Study was conducted during the period of peak oestrous activity (April to July).

Criteria of anoestrus in experimental goats

Following criteria were used for deciding anoestrous condition in Jamunapari goats:

1. Non parous goats, which failed to exhibit behavioral signs of oestrus after attaining the age of 18 months (puberty) and 65–75% of the adult body weight (22 - 25 kg) of Jamunapari breed.
2. Parous goats which failed to exhibit their first post-partum oestrus within 90 days of kidding.
3. Progesterone assay by ELISA technique using pathozyme progesterone kit; and spectrophotometer to ensure the absence of luteal activity prior to start of experiment/treatment (progesterone level ≤ 1.00 ng/ml of serum).

Hormonal protocol for induction of oestrus and ovulation

Goats in group 1 (treatment) were implanted @ half crestar implant per goat (1.5 mg norgestomet) subcutaneously and left *in situ* for 15 days. Concurrently, 1 ml of crestar solution (1.5 mg norgestomet and 2.5 mg oestradiol valerate) was administered to each goat by intramuscular route**.** A luteolytic dose (7.5 mg) of illiren was intramuscularly injected to each goat on 14 th day of implant insertion to regress functional corpus luteum, if any. Implants were taken out after 15 days. At withdrawal of implant an amount of 400–500 IU eCG (formerly PMSG) per goat was intramuscularly injected to stimulate follicular growth. All goats were checked for occurrence of oestrus at 12 h interval by an aproned buck consecutively for 96 h. At the time of induced oestrus each goat was administered 2.5 ml receptal to enhance ovulation. Responded goats were naturally mated twice at 10–12 h intervals by fertile bucks of Jamunapari breed. Pregnancy was initially monitored at day 14 and 21 after mating by estimating progesterone in serum and thereafter at day 40–60 of gestation by ultrasonography. It was finally confirmed on actual kidding. The data related to induction of ovulation and augmentation of kidding rate were suitably tabulated and analyzed following statistical methods (Snedecor and Cochran 1986).

RESULTS AND DISCUSSION

Hormonal response at induced and synchronized oestrus

The overall response of hormonal induction of oestrus and conception rate are set out in Table 1. The mean serum progesterone levels (±SEM) in experimental goats (24) before the commencement of hormone therapy was less than 1 ng/ml (0.25±0.05 ng/ml, range: 0–0.57), which showed the absence of luteal activity on ovarian surface. Out of 16, 14 (87.50%) goats exhibited induced oestrus within 96 h (34.28±3.29 h, range, 24–48 h) of implant withdrawal. All responded goats (14) exhibited behavioral symptoms of oestrus varying from medium to high intensity. The duration of induced and synchronized oestrus averaged 29.14±2.07 h (range, 24–48 h; Table 1).

Table 1. Fertility after crestar PG - eCG treatment in anoestrus Jamunapari goats

Attributes	Jamunapari	
	Treatment	Control
No. of Jamunapari goats	16	8
Goats exhibited oestrus within 96 h of implant removal (No.)	14 (87.50%)	-
Post treatment oestrus induction period (h)	34.28±3.29	-
Induced oestrus duration (h)	29.14±2.07	-
Kidding (%)	65.00*	-
No. of kids born	17	-
Kidding rate (kids born/doe)	1.88 (1–3)	

*Based upon serum progesterone concentrations and ultrasonographic examination.

Conception rate following induced oestrus and kidding

none of the oestrus induced goat (total: 14) returned to oestrus 21 days after mating, indicating 100% conception on non-return (N R) to oestrus basis. For confirmation of pregnancy, estimation of progesterone hormone (P_4) in serum (14 and 21 days after mating) and ultrasonography were performed (40–60 days after mating) in naturally mated does. The marked rise in progesterone concentrations at 14th day after induced oestrus and subsequent maintenance towards the end of cycle, i.e. at 21st day of induced oestrus, indicated the maintenance of pregnancy by the presence of active corpus luteum (*corpus luteum verum*). On the contrary progesterone concentrations declined gradually to basal level in goats (5) which were mated at the induced oestrus but did not conceive ($P<0.05$). During ultrasonographic examination, foetal heart beat, bowl shaped cotyledons and ribs were visible as hypo-echoic to anechoic structures on the ultrasound screen. Foetal movements were recognizable at this stage. Based upon these criteria pregnancy was confirmed in 9 goats (65%). After completion of normal gestation period 17 kids were born from 9 pregnant goats giving 1.88 kidding rate.

Anoestrus (pubertal and post partum) is a key factor limiting the life time productivity of any livestock enterprise. Anoestrus is a major reproductive problem in goats reared under farmer's flock (Goel and Sinha 2005). For the success of an induction and synchronization programme aiming for

fertility improvement, a high degree of oestrus response is desirable. The percentage of does exhibiting oestrus (87.50%) in present investigation is well comparable with the findings reported in the literature for goats and sheep (Ungerfeld and Rubianes 2002, Avendano *et al.* 2003, Dogan *et al*. 2004).

The ultimate aim of any oestrus induction programme is to restore normal cyclicity with higher conception rate. In the present study, a conception rate of acceptable degree was obtained (65%) which was higher than reported by Holtz and Sohnrey (1992), Reguerio *et al.* (1999), Ungerfeld and Rubianes (2002), and Dogan *et al.* (2004) in goats and Husein *et al.* (2002) in sheep (42.0 to 55.0%). However, Goel *et al.* (2009) in Jakhrana goats (71.00%), Greyling and Vander Nest (2000) in Boer and Feral goats (74.20%), Rowe and East (1996) in lactating dairy goats (90.00%) and Zeleke *et al.* (2005) in Dorper ewes reported better pregnancy rates (91.10%). It was probably due to large number of animals, source of eCG (PMSG) and variation in dose used by retrospective workers in their studies. In this study, 17 Jamunapari kids were born out of 9 Jamunapari goats conceived following natural mating at induced and synchronized oestrus with 1.88 kidding rate. Present findings in terms of overall kidding rate are better (1.58) than that reported for Jakhrana goats (Goel *et al.* 2009). In cycling Malabari goats, Selvaraju *et al.* (2004) reported better (2.00) overall kidding rate by using a higher dose PMSG (eCG) with combination of different oestrus synchronizing agents. Other studies conducted on similar lines in anoestrus goats using progesterone and eCG in different combination did not report fecundity rate, hence comparison was not possible for kidding rate. The hormonal combination used in this study was effective to induce and synchronize oestrus and fertility in anoestrus (parous and non parous) Jamunapari goats.

Present results indicated that oestrus cyclicity can be regained effectively and fertility of higher degree can be restored in the Jamunapari goats by using the present hormonal protocol. Further experiments however, need to be carried out in other season of peak sexual activity including more number of animals so as to reconfirm the effectiveness of the treatment. There is no information available in the scientific literature on these aspects in Jamunapari goats, therefore, present findings will form the basis for further studies in this important tropical goat breed in particular and goat breeds in general for enhancing their productivity.

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