COMPARATIVE EFFICACY OF NORGESTOMET-BASED ESTROUS INDUCTION PROTOCOLS IN BEETAL GOAT

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ABSTRACT

Sixty post-partum anestrus beetal goats were randomly divided into three groups of 20 each to compare the efficacy of norgestomet with or without prostaglandin ($PGF_{2\alpha}$) or eCG or both. Each goat subcutaneously received half norgestomet implant (1.5 mg) for 11 days either with eCG 500 IU on day 9 (Gp Norg+eCG), with $PGF_{2\alpha}$ 50 μg on day 10 (Gp Norg+PG) or with both eCG and PG on day 9 and 10 of protocol, respectively (Gp Norg+eCG+PG). Subsequent to implant removal, estrus was detected twice a day using aproned buck and animals in estrus were mated twice at 12 h interval. Among the groups, highest estrus response ($p>0.05$) and minimum time to onset of estrus ($p<0.05$) following implant removal was observed in gp Norg+eCG+PG compared to other groups, although the duration of estrus was similar ($p>0.05$) between groups. Conception rate and total kids varied between groups in the range of 57.9 to 83.3% and 19 to 28, respectively, with highest ($p<0.05$) kidding rate in gp Norg+eCG. In brief, norgestomet-based protocol can be successfully used to induce estrus in anestrus Beetal goats.

Keywords: Anestrus, Beetal goat, Conception rate, Estrus induction, Norgestomet

INTRODUCTION

Beetal is a dual-purpose goat breed known for its large body size and high fecundity. This breed is highly adaptable to various agro-climatic zones, stall-feeding practices and is found in Punjab along with some parts of Haryana state. In goat breeding, low reproductive efficiency due to post-partum anestrus or prolonged kidding interval is considered as a major constraint. The variability in estrous cycle and kidding interval has necessitated the use of estrous synchronization / induction in the reproductive management of goats (Pietroski *et al*., 2013). A number of studies have been carried out to evaluate various protocols for estrous synchronization / induction in various breeds of goats for increasing their productive period through the use of progestagens, prostaglandin ($PGF_{2\alpha}$) and eCG (equine chorionic gonadotropin; Mellado *et al*., 1997 and Oliveira *et al.,* 2001). The present study was planned in Beetal goats to compare the estrous induction efficacy of norgestomet with prostaglandin or eCG or both.

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MATERIALS AND METHODS

The present study was carried out in two phases (April and May). Each phase constituted 30 goats comprising 10 goats per group in each phase. The post-partum anestrous goats (n=60) were divided into three groups of 20 each; accordingly during each phase there were 10 goats in each group. Each goat was subjected to half norgestomet (Crestar, 1.5mg, MSD Animal Health) implant subcutaneously on the upper side of an ear and left *in situ* for 11 days. In addition, group Norg+eCG goats received 500 IU eCG (Folligon, MSD Animal Health) on day 9, group Norg+PG received 50 μg $PGF_{2\alpha}$ (Cloprostenol, Virbac India) on day 10 and, group Norg+eCG+PG received 500 IU eCG on day 9 and 50 μg $PGF_{2\alpha}$ on day 10 of the protocol. Jugular vein blood sampling (5 ml) was carried out on days 0, 3, 7, 8, 9, 10, 11, 12 and 13 of the protocols. Plasma was separated by centrifugation at 3000 rpm for 15 minutes and stored at -20°C until estimation of progesterone concentrations through

Table 1: Outcome of different estrous induction protocols in Beetal goat. Norg, Norgestoment; eCG, equine chorionic gonadotropin; PG, Prostaglandin $F_{2\alpha}$

Parameter	**Norg + eCG,** n=20	**Norg + PG**, n=20	**Norg + eCG + PG**, n=20
Estrus response, n (%)	16 (80)	17 (85)	19 (95)
Time to onset of estrus, h	20.58±2.2[b]	28.33±2.2[a]	15.63±2.1[b]
Duration of estrus, h	24.14±0.62	24.84±0.61	23.43±0.57
Conception rate, n (%)	10 (68.7)	14 (83.3)	10 (57.9)
Total Kids, n	23	28	19
Kidding rate, n (%)	2.3[a]	2.0[b]	1.9[b]
Single, n (%)	3 (30)	2 (14.3)	2 (20)
Twin, n (%)	2 (20)[b]	10 (71.4)[a]	7 (70)[a]
Triplet, n (%)	4 (40)	2 (14.3)	1 (10)
Quadruplet, n (%)	1 (10)	-	-

Values bearing different superscripts differ significantly ($p<0.05$) within a row

ELISA procedures.

After removing the implant on day 11, estrus was detected twice a day by using an aproned buck. The animals detected in estrus were mated to a buck twice at 12 h interval in an enclosed pan and was observed for mating. Using B-mode ultrasonography, pregnancy was monitored on day 60 after mating. The onset of estrus was determined as the time between the implant removal and the first encounter(s) with a male without showing estrous behavior and half the time between last encounter with a male showing first time tail flagging or standing estrus. The end of estrus was set halfway between the last standing estrus and the first rejection of male. The difference between these two half ways in the same estrous period contributed to duration of estrus. The statistical procedures for significance detection ($p<0.05$) between groups consisted of two-way ANOVA for progesterone, one-way ANOVA for onset of estrus and duration of estrus and Chi Square test for conception rate and kidding rate.

RESULTS AND DISCUSSION

Following estrous induction in postpartum anestrous Beetal goats, the overall success rate with respect to estrous response was 86.7%. There was no difference ($p>0.05$) in estrous response between different protocols, however highest response was observed in Beetal goats administered norgestomet, $PGF_{2\alpha}$ and eCG (Table 1). It is a well-known fact that progestagen prevents new corpora lutea (CL) formation while $PGF_{2\alpha}$ ensures luteolysis of CL, if any, and eCG improves the synchronization (Martemucci *et al*., 2011). In addition, the time to onset of estrus following implant removal was minimal in group Norg+eCG+PG as compared to others ($p<0.5$, Table 1).

Considering the synchronization of induced estrus, about 85% Beetal goat exhibited estrus within 24 h of implant removal in group Norg+eCG+PG, whereas, in group Norg+eCG, 45% goats exhibited estrus within 24 h and nearly 80% exhibited estrus within 36 h. In group Norg+PG, only 40% goats exhibited estrus within 24 h, and in the remaining goats, exhibition of estrus was delayed up to 60 h. These results indicated that synchronization of induced estrus was maximum in goats subjected to combined effect of norgestomet, eCG and $PGF_{2\alpha}$, which was in consonance with the results obtained in anestrous dairy goats (Bretzlaff and Madrid, 1989). The delayed and variable time to onset of estrus in group Norg+PG, might be due to the

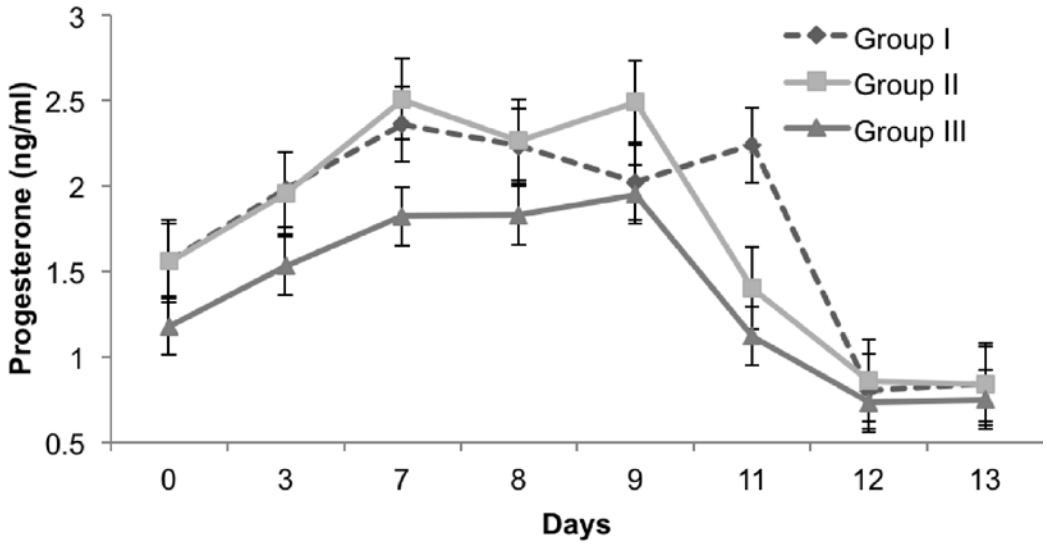

Figure 1: Plasma progesterone in Beetal goats subjected to estrous induction protocols. Group I (Norg), Group II (Norg+eCG), Group III (Norg+eCG+PG)

delayed responsiveness of the CL to prostaglandins. The duration of estrus in Beetal goats of present study was similar between groups ($p>0.05$, Table 10 and these results were in accordance with the results reported as 24.9 h in Saanen goats (Pietroski *et al*., 2013).

Overall conception rate observed in the present study was 65.4%, with variation in the range of 57.9 to 82.3% ($p>0.05$, Table 1). The main observation revealed that the groups of goats receiving eCG had poor conception rate which could be due to reduction in time to onset of estrus as a consequence of eCG administration. In fact, eCG promotes early occurrence of pre-ovulatory LH peak, which might have induced premature ovulation resulting in poor fertility (Cameron and Batt, 1991). Another possibility might be the exhaustion of bucks used for the mating in groups Norg+eCG and Norg+eCG+PG. In these groups majority of goats exhibited estrus within 24-36 h and only one buck was spared for each group during the two phases of study in April and May. It could be hypothesized that these bucks were exhausted, as they had to mate the goats in estrus within a short interval. It is recommended that one buck should be used for 5 to 7 does during estrous synchronization where mating had to be done in a short period of time (Abecia *et al*., 2012). The higher conception rates obtained in group Norg+PG could be e by the fact that the goats of this group exhibited estrus over a wide period of time extending up to 60 h. Hence, the buck got more time to mate the does which resulted in improved conception rates.

Overall kidding rate (2.06) obtained in the present study was higher than the results reported earlier as 1.53 in Saanen goats (Oliveira *et al*., 2001) and 1.58 in Jakhrana goats (Goel *et al*., 2009). The frequency of single kid was similar ($p>0.05$) between groups, however, twinning was the commonest ($p<0.05$) in groups Norg+PG and Norg+eCG+PG (Table 1). The highest numbers of triplets and a quadruplet in group Norg+eCG (Table 1) could be due to the superovulatory effect of eCG hormone (Loboeuf *et al*., 1998).

In the present study, plasma progesterone in all the groups increased from day 0 (day of implant insertion) to day 7 ($p<0.05$), and a plateau was observed till day 9 of the protocol (Figure 1). On day 11, no decrease in plasma progesterone was observed in group

Norg+eCG, while the other two groups exhibited a drop in the plasma progesterone ($p<0.05$, Figure 1), indicating the luteolysis of previously present CL. All the groups had plasma progesterone below 1 ng/ml subsequent to implant removal. Therefore, it could be concluded that the rise in plasma progesterone during the first 9 days of protocol was due to norgestomet implant (Rubians *et al*., 1998). It could be concluded that the high degree of estrous response with acceptable conception rates were achieved in all norgestomet-based groups but estrous response was more concise in the protocol including eCG and $PGF_{2\alpha}$.

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