

## Accelerated Kidding System in Goats through Oestrus Synchronization and Artificial Insemination

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### Abstract

*The present study aimed at exploring the effective synchronization and fixed time artificial insemination protocol in goats. The does were randomly divided into four groups of ten each. Synchronization protocol followed for Group I, II and III does were administrated with intra vaginal sponge of Progesterone, Fluorogestone acetate (FGA) and TRIU-C followed by PGF2  $\alpha$  and PMSG, respectively. Group IV does in natural estrus served as control. Fixed time artificial insemination done for group I, II, III whereas group IV does artificial insemination based on estrus signs. Early pregnancy diagnosis was done using ultrasonography at day 30 post insemination. The conception rate in the present study were 60(6/10), 50(5/10), 70(7/10) and 50(5/10) per cent in treatment group I, II, III and control group IV, respectively. Results indicate progesterone containing intra vaginal sponges or TRIU C, PGF2  $\alpha$  and PMSG combination is more efficient for estrus synchronization and fixed time artificial insemination in goats.*

**Keywords:** Estrous Synchronization, Fixed Time Insemination, Goats, Progesterone

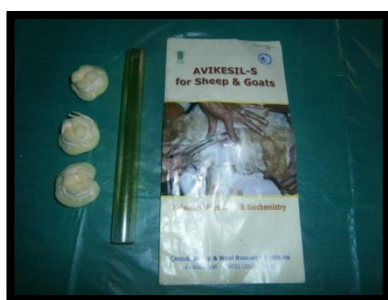
## Introduction

Throughout rural India, large number of small farmers, landless laborers and women depend on few heads of goats for their livelihood. Small ruminants are very well suited for the integrated farming system of small and marginal farmers who are contributing the major share of goat production. Assisted reproductive technologies can be utilized to minimize kidding interval and to increase number of kidding per does which will be a boon to the goat rearers. Accelerated kidding is a profitable technique which can be used in small ruminants to increase the number of kids per year. Since, accelerated kidding program initiate cycling more often, resulting three kidding from single doe per two years. This can be achieved through nutritional management, early weaning of kids from does, estrous synchronization and fixed time insemination by using hormones.

Goats reproduction can be controlled by manipulating estrous cycle so that female express estrus approximately the same and desirable time (Zhao *et al.*, 2010). Estrous synchronization and artificial insemination are most powerful biotechnology tool that have hastened genetic progress and enhanced fertility in goats (Omontese *et al.*, 2016). Generally, oestrus synchronization/induction involves manipulation of either follicular phase or luteal phase of the estrous cycle of which manipulation of luteal phase is mainly used as it is of longer duration than follicular phase. Numerous approaches are employed to manipulate luteal phase either by extending the luteal phase by exogenous progesterone or more potent progestagens (Abecia *et al.*, 2012) administration or by shortening the luteal phase by regressing corpus luteum. Owing to the above said advantages, in the present study oestrus synchronization was brought about by using intra vaginal progesterone sponges, TRIU C, prostaglandin F2 alpha (PGF<sub>2α</sub>) and Pregnant mare serum gonadotropin (PMSG) in combinations followed by fixed time insemination to study the conception rate.

## Materials and Methods

The study was undertaken in forty postpartum Tellicherry goats (30 to 45 days after kidding) under uniform farm condition and feeding managements. All the goats were selected based on their body score condition and gynaecological examination. The goats were randomly divided into four groups of ten each. Group I does were inserted with progesterone intra vaginal sponge (CSWRI, Avikanagar, Fig.1) for 10 days. Group II does were inserted with an intravaginal sponge impregnated with Fluorogestone acetate (40mg; Chronogest, Intervet, Netherlands, Fig. 2) for 10 days. Group III does were inserted with intra vaginal progesterone device TRIU C (Virbac, India). Intramuscular injection of cloprostenol sodium (Synthetic PGF<sub>2α</sub> analog) of 125µg, was administered 24 hours (Day 9; 8 AM) before the removal of progesterone sponge (on day 10) and PMSG 200 IU (Folligon) was administered at the time of removal of the intra vaginal sponge for all the animals in group I, II and III. AI was done at 48 and 56 hours after the removal of intra vaginal sponge (Day 13; 8 AM and 4 PM). Group IV does in natural estrus served as control. All the does in control group were subjected to AI after expression of behavioral oestrus and conception rate was studied. Early pregnancy diagnosis by ultrasonography was carried out at day 30 post insemination. The pregnancy was confirmed by the presence of foetus and amniotic fluid.



**Figure 1:** Progesterone impregnated intra vaginal sponge



**Figure 2:** Intravaginal sponge impregnated with Fluorogestone acetate



**Figure 3:** Intra vaginal progesterone device TRIU C

## Results and Discussion

In the present study, the difference in the conception rate between the groups were not affected by season, breed and farm management. The conception rate in the present study were 60(6/10), 50(5/10), 70(7/10) and 50(5/10) per

cent in treatment group I, II, III and control group IV, respectively. The significant conception rate was obtained for the group III animals synchronized with intra vaginal device (TRIU C) + PGF<sub>2α</sub> + PMSG (70 per cent) than the other synchronized and control groups followed by group I animals synchronized with intravaginal progesterone sponges (60 per cent).

The increased conception and kidding rates in goats could be achieved by the controlled breeding programmes, which involve manipulation of the estrous cycle and artificial insemination at a predetermined time. This requires precise synchronization of oestrus which could be brought about by the administration of exogenous hormones, thus manipulating the follicular and luteal activity. In order to achieve this goal, progestagen analogues are usually used to synchronize oestrus in goats during the breeding and non-breeding season (Ak *et al.*, 1998). Progestagen analogues have an inhibitory effect on the release of luteinizing hormone (LH) from the anterior pituitary so that the endocrine events that influence the maturation of the ovarian preovulatory follicles and their later ovulation are suppressed. Hence, following withdrawal of progesterone, oestrus and ovulation occur at a predictable period of time (Bretzlaff, 1997). The most common route of application of progestagens in goats is intravaginal sponge or pessaries and intravaginal devices. The two commonly used intravaginal sponges (pessaries) for synchronization and/or induction of oestrus in does are medroxyprogesterone acetate (MAP) and fluorogestone acetate (FGA) (Motlomelo *et al.*, 2002). Even though these two progestagens are equally effective in synchronization of oestrus, ovulation and fertility (Smith *et al.*, 1981), FGA were found to be more preferable by most researchers (Dogan *et al.*, 2005, Bukar *et al.*, 2012). Intravaginal device used are CIDR and TRIU-C are the common intravaginal devices used for synchronization. Estrous response for progesterone TRIU-C protocol in Malabari cross-bred goats was 100 per cent Panicker *et al.* (2015) suggested that the progestagen (TRIU-C) was more effective than the standard Ovsynch and prostaglandin regimen for the oestrus induction in the goats of tropical region.

Pregnant mare serum gonadotropin (PMSG) having follicle stimulating hormone (FSH) and luteinizing hormone (LH) activity when administered 48 h before (non-breeding season) or at progestagen withdrawal (breeding season) have shown to stimulate follicular growth in both anoestrous and cycling goats and affect the time of ovulation (Bretzlaff, 1997). At the same time the use of the synthetic PGF<sub>2α</sub> analogue cloprostenol causes luteolysis in does having a functional corpus luteum at the end of the treatment (Motlomelo *et al.*, 2002). The conception rate was relatively higher with PGF<sub>2α</sub>, FGA impregnated sponges, PMSG and PGF<sub>2α</sub>, FGA, GnRH than double injections of PGF<sub>2α</sub> but, with no significant differences (Abdalla *et al.*, 2014). The result of the present study was in accordance with Hussein *et al.* (2003) who found that Rahmani ewes treated with 400 IU PMSG showed conception rate of 70 per cent. To enhance the oestrus response and pregnancy rate after progestagen treatment during breeding season, luteal regression with a PGF<sub>2α</sub> injection should be ensured (Menchaca and Rubianes, 2004). Hence, in the present study FGA sponge, PGF<sub>2α</sub>, and PMSG protocol was utilized which yielded better result than non-synchronized group which is in accordance with the study of Abdalla *et al.* (2014) who reported that protocol using PGF<sub>2α</sub>, FGA sponge and PMSG appeared to be more effective in the synchronization of oestrus, fertility and fecundity rates and litter size than other protocols in Barki ewes.

A further aspect that could be improved is the timing of AI. Lopez-Sebastian *et al.* (2007) suggest that ovulation occurs around 52.5 h post-treatment and the best time for AI is 46 h after treatment. In contrast, Menchaca and Rubianes (2004) reported that the pregnancy rate obtained with a single TAI was higher when insemination was performed at 54 h than at 48 h after device withdrawal and eCG administration. In this study fixed time artificial insemination at 48 hrs and 56 hrs time-point carried out based on practical management of the animals.

## Conclusion

The method proposed, is an adequate alternative to the conventional methods or non-synchronized breeding with respect to estrous response and fertility rate. On the basis of findings in present study it can be concluded that the use of progesterone containing intra vaginal sponges or TRIU C, PGF<sub>2α</sub> and PMSG combination is more efficient for estrus synchronization, fixed time artificial insemination and to get high fertility rates in goats.

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## Conflict of Interests

There is no conflict of interest.

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