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GnRH formulated drug: An effective tool for estrus synchronization on the basis of fecundity rate in Kilakarsal ewes during main season

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Abstract
The current research work was undertaken to induce estrus synchronization in Kilakarsal ewes, using chitosan Nano conjugated GnRH and to assess its efficacy on the fertility rate of Kilakarsal sheep during the main season under semi-intensive farming conditions by comparing the same with various drug protocols. Ewes in the control group were not given any treatment. The group I ewes were treated with CIDR alone. The group II ewes were treated with CIDR and GnRH. The group III ewes were treated with CIDR and $PGF_2\alpha$. The group IV ewes were treated with CIDR, $PGF_2\alpha$, and GnRH. The group V ewes were treated with CIDR and Nano conjugated GnRH. The group VI ewes were treated with CIDR, $PGF_2\alpha$, and Nano conjugated GnRH. During the main season, the % of ewes that lambed as against the total number of ewes that were mated in each group were 71.42, 81.25, 83.33, 88.23, 94.11, 94.73 and 100.00 in the control and groups I to VI, respectively The highest fecundity % was observed in the groups V (94.73) and VI (100.00) From this research Nanoconjugated GnRH is an economic alternative method that offers reasonable pregnancy rates and it is very safe in Kilakarsal ewes.

Keywords: CIDR, kilakarsal ewes, estrus synchronization, and Nano conjugates GnRH

Introduction
Small ruminants (sheep and goats) play an important role in the survival, economic and social livelihoods of human beings, more significantly in developing countries (Kosgey *et al.*, 2007) [6] Estrus synchronization (ES) or the induction of estrum in sheep is a valuable breeding tool available for improving fertility rate as reported by Iida *et al.* (2004) [3]. Progesterone-impregnated intra-vaginal sponges in the breeding season or the uses of the progesterone-impregnated vaginal device are widely used methods for the synchronization of estrus. Although both options can give high or acceptable rates of ES and lambing they have some disadvantages of being applied for an extended period. One of them is the high cost for the treatment and other is the vaginal mucosa inflammation with discomfort and purulent discharge induced by the Progesterone intra-vaginal sponges (Kulaksiz *et al.*, 2013) [7]. Hence, the present study was undertaken to prepare Nano conjugated GnRH using chitosan as carrier for ES and to study the efficacy in Kilakarsal sheep.

Materials and Methods
The study was carried out in Kilakarsal sheep maintained under a semi-intensive system of rearing at the Instructional Livestock Farm Complex, Veterinary College and Research Institute, and District Livestock Farm, Abishegapatti, Tirunelveli. Chitosan nanoparticles were prepared by ionic cross-linking of chitosan solution with Sodium Tripolyphosphate (TPP) anions as per the standard protocol described by Bharali *et al.* (2008) [2].

Selection of Animals and Experimental Design
A total of 140 cyclic ewes, irrespective of age and body weight were selected for this study. They were randomly divided into 14 groups of 20 animals each. Ewes in the first seven groups were taken for the experiment during the main season (Jul-Aug) the first group was kept as control while the other six groups were numbered I to VI and subjected to six different hormonal treatments for ES as per the regimen described below.

Table 1: Show Treatments and Number of ewes

Groups	Treatments	Number of EWES
Control	Without any treatment	20
Group-I	CIDR	20
Group-II	CIDR with GnRH	20
Group-III	CIDR with $PGF_2\alpha$	20
Group-IV	CIDR, $PGF_2\alpha$ with GnRH	20
Group-V	CIDR with Nano conjugated GnRH	20
Group-VI	CIDR, $PGF_2\alpha$ with Nano conjugated GnRH	20

Result and Discussion

Fecundity Rate

Based on the number of lambs that were born alive as against the total number of ewes that were mated in each group, the fecundity rate was worked out and the values are presented in Table 2.

During the main season, the % of Kilakarsal ewes that lambed as against the total number of ewes that were mated in each group were 71.42, 81.25, 83.33, 88.23, 94.11, 94.73, and 100.00 in the control and groups I to VI, respectively. The highest % was observed in groups V and VI were 94.73 and 100.00.

Ataman and Akoz (2005) [1] conducted a synchronization trial in Akaraman ewes and reported that the conception rate and lambing rate were 85.70 and 83.30% in GnRH with $PGF_2\alpha$ treatment and 84.60% and 81.80% in $PGF_2\alpha$ double dose regimen, respectively.

Jafaryadi *et al.* (2011) [4] conducted a synchronization trial in Kalkuhi ewes during early anestrus season with Progestagen vaginal sponge, CIDR with PMSG and $PGF_2\alpha$ two-dose regimen and found that the pregnancy rate was higher (70%) in $PGF_2\alpha$ group compared with that of Progestagen (45%) and CIDR (35%).

Kor *et al.* (2012) [5] conducted a trial in Kermanie ewes with short time protocol based on combined FGA, $PGF_2\alpha$, GnRH, and eCG treatment and the fertility rate varied from 42.82 to 93.30%, and the fecundity between 46.12 to 73.00%.

Martinez *et al.* (2019) [8] found that Protocols based on short-term (5 days) CIDR treatments and a double administration of GnRH assure the occurrence of fertile and synchronized ovulations for protocols based on the use of short-term CIDR treatments and eCG at device withdrawal.

Table 2: Effect of different estrus synchronization on the fertility and fecundity rate % during the main season in Kilakarsal ewes

Main Season	Control	Group I CIDR	Group II CIDR with GnRH	Group III CIDR with $PGF_2\alpha$	Group IV CIDR, $PGF_2\alpha$ with GnRH	Group V CIDR with nano-conjugated GnRH	Group VI CIDR, $PGF_2\alpha$ with nano-conjugated GnRH
Total no of ewes in each group	20	20	20	20	20	20	20
No of ewes mated	14	16	18	17	17	19	19
No of ewes lambed	11	13	15	15	16	18	19
Fertility rate % based on total no of ewes treated	55.00	65.00	75.00	75.00	80.00	90.00	95.00
Fertility rate % based on no of ewes mated	78.57	81.25	83.33	88.23	94.11	94.73	100.00
No of lambs born alive	10	13	15	15	16	18	19
Fecundity rate %	71.42	81.25	83.33	88.23	94.11	94.73	100.00

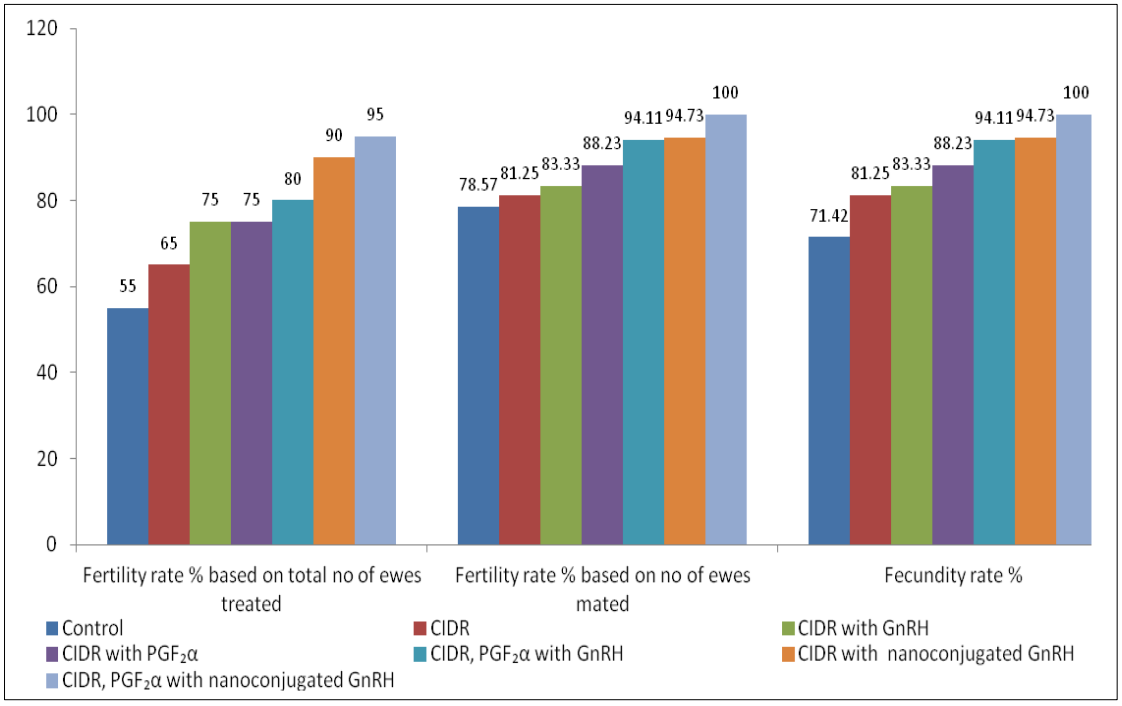

Fig 1: Effect of different estrus synchronization on the fertility and fecundity rate % during the main season in Kilakarsal ewes

From the findings in this study, the following inferences were drawn.

A: The tupping, fertility, and fecundity % were better in the main season under all treatment conditions.

B: In general ES by adopting newer drug protocols offered better reproductive results than the controls.

C: Among the various protocols adopted the treatment involving administration of either CIDR or Nano conjugated GnRH or CIDR, $PGF_2\alpha$ and Nano conjugated GnRH as used in the groups V and VI gave the best results in terms of fertility and fecundity %.

Conclusion

From the results of findings it may be concluded that the novel protocol of combining CIDR, with or without $PGF_2\alpha$ and Nano conjugated GnRH is an economic alternative method that offers reasonable pregnancy rates and it is very safe in Kilakarsal ewes.

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