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Comparative research on estradiol levels of Kilakarsal sheep in various estrus synchronization treatments during the off-season

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Abstract

In sheep, exogenous hormones are utilized in an accelerated lambing system for induction of estrous synchronization and to enhance cyclicity in anestrus which will assist in helping the system to produce lamb continuously throughout the year. To initiate the hormonal events of estrous synchronization, therapy approaches may include gonadotropin-releasing hormone, also known as GnRH and Nano GnRH. Exogenous progesterone (P4) or prostaglandin (PGF_{2α}) administration modifies the length of the estrous cycle by either extending it or reducing it. Here we aim to investigate the effect of various estrous synchronization procedures in Kilakarsal ewe's reproductive cycles during the off-season. Blood samples were collected with jugular venepuncture on the following days, on CIDR insertion, CIDR removal, estrum, on the day of mating and on the 70th day of pregnancy. Serum samples were analyzed using an ELISA kit (RIA) and a direct immunoenzymatic method to figure out the amount of estradiol. The findings revealed that Kilakarsal ewes exhibited higher oestradiol levels in estrum in all the experimental groups, ranging between 13.780.17 to 15.500.43 ng/mL. The investigation of the results revealed the use of the chitosan nano- conjugated GnRH regimen for ES in Kilakarsal sheep had actual advantages. The Results effectively proved the real advantages of the Kilakarsal ewes' ES method utilizing chitosan Nano conjugated GnRH.

Keywords: Kilakarsal ewes, Estradiol and Nano conjugated GnRH

Introduction

Sheep are "short day" breeders as they start to cycle and become sexually responsive during the later part of summer to early autumn (Robinson and Karsch, 1988) [4]. Commercial sheep enterprises use intravaginal CIDRs as a controlled reproductive management approach. Only limited research data is available on estrous synchronization protocols using CIDR when combined with hormones like GnRH and PGF_{2α}. Here, we assess the effect of various estrous synchronization protocols with gonadotropin-releasing hormone (GnRH) conjugated with nano-particle on estradiol concentration in Kilakarsal ewes during the reproductive cycle of the off-season.

Materials and Methods

The experiment was carried out in Kilakarsal ewes, reared in a semi-intensive system at District Livestock Farm in Abishegapat, Tirunelveli, during off-season, from January to February. In order to conduct the experiment, 140 cyclic Kilakarsal ewes are selected randomly and divided into seven groups with twenty animals in each group. Designing the 1st group as control, the other groups are numbered I to VI and received six different hormonal therapies for estrus synchronization as depicted in Table 1. Blood samples were collected from all the animals at various intervals throughout the trial, as follows:

1st Sampling: On CIDR insertion.

2nd Sampling: CIDR removal.

3rd Sampling: Estrum.

4th Sampling: Day of mating.

5th Sampling: 70th day of pregnancy.

According to Tsang *et al.* (1980) [2], serum was isolated from the blood samples and estradiol concentration was measured using a direct immunoenzymatic approach with an ELISA kit purchased from Agappe Diagnostics Limited.

Result and Discussion

In Table 1, the mean serum estradiol concentration of the control group and other ewe groups at various stages of the

reproductive cycle during the off-season are shown. The serum estradiol levels in the control and various treatment groups fluctuated between 4.14±0.06 to 4.22±0.05, 5.54±0.42 to 6.94±0.34, 13.78±0.17 to 15.50±0.43, 13.26±0.14 to 13.79±0.19 and 2.69±0.04 to 2.86±0.07 ng/mL, respectively on the day of CIDR insertion, CIDR removal, day of estrum, day of mating and on the 70th day of pregnancy respectively.

Table 1: The control group's and other group's average blood estradiol levels at various stages of the ewes' reproductive cycles during off-season production

Different stages of reproductive cycle	Control	Group I	Group II	Group III	Group IV	Group V	Group VI
		CIDR	CIDR with GnRH	CIDR with PGF _{2α}	CIDR, PGF _{2α} with GnRH	CIDR with nano-conjugated GnRH	CIDR, PGF _{2α} with nano-conjugated GnRH
Off-season							
On the day of CIDR insertion ^{NS}	4.20 ^b ±0.05	4.22 ^b ±0.05	4.17 ^b ±0.05	4.14 ^b ±0.06	4.19 ^b ±0.06	4.15 ^b ±0.06	4.18 ^b ±0.16
On the day of CIDR removal	5.54 ^{Ac} ±0.42	5.93 ^{ABc} ±0.44	6.14 ^{ABc} ±0.46	5.79 ^{ABc} ±0.44	6.16 ^{ABc} ±0.48	6.91 ^{Bc} ±0.36	6.94 ^{Bc} ±0.34
On the day of estrum	15.50 ^{Bc} ±0.43	15.04 ^{Bc} ±0.24	14.80 ^{Bc} ±0.22	14.96 ^{Bc} ±0.26	13.93 ^{Ac} ±0.22	13.92 ^{Ac} ±0.15	13.78 ^{Ac} ±0.17
On the day of mating ^{NS}	13.34 ^d ±0.19	13.65 ^d ±0.24	13.79 ^d ±0.19	13.47 ^d ±0.14	13.66 ^d ±0.23	13.26 ^d ±0.14	13.43 ^d ±0.14
On the 70 th day of Pregnancy ^{NS}	2.86 ^a ±0.07	2.72 ^a ±0.04	2.73 ^a ±0.04	2.76 ^a ±0.05	2.73 ^a ±0.06	2.69 ^a ±0.04	2.73 ^a ±0.05

Means bearing different superscripts in a row (Upper case A, B) differ significantly between groups at 5% ($p < 0.05$)

Means bearing different superscripts in a column (small case a, b, c) differ significantly within groups at 5% ($p < 0.05$) and ^{NS}-Non significant ($p < 0.05$)

From the values recorded the control showed the lowest value of estradiol which was significantly ($p < 0.05$) different from that of the groups V and VI which showed the highest values on the day of CIDR removal. Similarly, on the day of estrum, the groups IV, V and VI showed lower values when compared to that of control, group I, II and III the differences were significant ($p < 0.05$).

The variances were statistically significant, although the values raise from the day of CIDR insertion to the day of estrum and then tended to go off as seen on the day of mating and the 70th day of pregnancy. While there was a general upward trend in all treatment groups, the maximum levels in Kilakarsal ewes ranged from 13.78 to 15.50 ng/mL on the day of estrum.

According to Terqui *et al.* (1973) [1], the concentrations of 17 estradiol in the plasma raise three days before estrus, peaked on the day of estrus, and then started to fall.

According to Thomas *et al.* (1988) [3], estradiol levels peaked at 10-15 pg/mL but typically ranged from 7-8 pg/mL. According to all of the aforementioned writers, Kilalarsal ewes in the control and all treatment groups had the highest serum estradiol values on the day of estrum.

It can be assumed that the Nano conjugated GnRH and CIDR, PGF₂ protocol used to induce ES had a normal and safe reaction in the ewes and could be used in the field to boost sheep output.

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