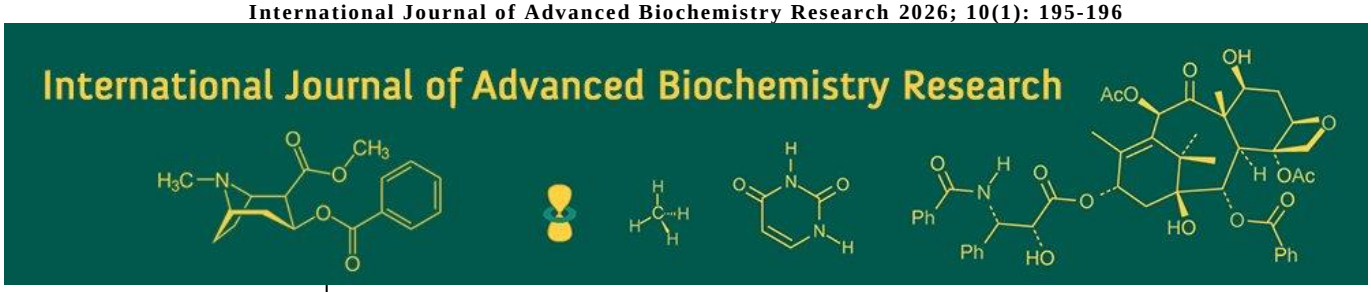

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Gagan Raj DR
MVSc Scholar, Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Bengaluru, Karnataka, India

BR Suchitra
Assistant Professor, Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Bengaluru, Karnataka, India

Narasimha Murthy
Associate Professor, Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Hassan, Karnataka, India

Renukaradhya GJ
Associate Professor, Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Bengaluru, Karnataka, India

Yathish HM
Senior Scientist, Animal Genetics and Breeding, ICAR-National Research Centre on Mithun, Medziphema, Nagaland, India

Veena MP
Assistant Professor, Department of Veterinary Physiology, Veterinary College, Bengaluru, Karnataka, India

Corresponding Author:
Gagan Raj DR
MVSc Scholar, Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Bengaluru, Karnataka, India

Comparative evaluation of exogenous insulin administration with Co-synch protocol on fertility response in goats reared under semi-intensive system

Gagan Raj DR, BR Suchitra, Narasimha Murthy, Renukaradhya GJ, Yathish HM and Veena MP

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Abstract
The present study was undertaken to compare the fertility response of goats subjected to Co-synch protocol with and without exogenous insulin supplementation under semi-intensive management. Twelve apparently healthy, cyclic, non-pregnant does were randomly divided into two groups: Group I (Insulin + Co-synch) and Group II (Co-synch alone), with six animals in each group. Estrus induction rate was 100 percent in both groups. The mean onset and duration of estrus were comparable, though insulin-treated does exhibited relatively stronger estrus expression. Conception rate was identical in both groups (83.33%), with no pregnancy wastage recorded. Gestation length and kidding rate (100%) were not affected by insulin supplementation. Litter size was higher in Group I (1.33) compared to Group II (1.00). The study indicated that insulin supplementation along with Co-synch protocol resulted in improved litter traits without significantly altering conception rate in semi-intensive systems.

Keywords: Goats, insulin, co-synch, estrus synchronization

Introduction
Estrus synchronization protocols such as Co-synch are widely used in goats to improve breeding efficiency (Greyling and Van Niekerk, 1986; Pujar *et al.*, 2016) [3, 6]. However, fertility response to these protocols is influenced by metabolic and nutritional status. Insulin, a key metabolic hormone, plays an important role in ovarian follicular growth, steroidogenesis and embryo survival (Velazquez *et al.*, 2005; Ramoun *et al.*, 2007; Abecia *et al.*, 2012) [8, 7]. Supplementation of insulin along with synchronization protocols has been reported to improve reproductive performance in ruminants. The present study aimed to compare the reproductive performance of goats treated with Co-synch protocol with and without insulin supplementation under semi-intensive management conditions.

Materials and methods
The study was conducted at the Department of Veterinary Gynaecology and Obstetrics, Veterinary College, Bengaluru. Twelve apparently healthy, cyclic, non-pregnant does aged between 1 and 4 years were selected and maintained under semi-intensive management. The animals were randomly divided into two groups (n = 6 each). Group I received insulin in combination with Co-synch protocol, while Group II was treated with Co-synch protocol alone. The Co-synch protocol consisted of 4 µg Buserelin acetate on day 0, 125 µg Cloprostenol on day 7 and a second dose of 4 µg Buserelin on day 9. In Group I, long-acting insulin was administered subcutaneously at 0.2 IU/kg body weight on days 7, 8 and 9. All does were naturally mated twice on day 9. Estrus induction rate, Time to onset of estrus, Duration of estrus, conception rate, Pregnancy wastage, gestation length, litter size, kidding rate and sex ratio were recorded.

Results
Estrus induction rate was 100.00 percent in both Group I (Insulin + Co-synch) and Group II (Co-synch alone), indicating that the Co-synch protocol was effective in inducing estrus

under semi-intensive management conditions. The mean time to onset and duration of estrus were comparable between the two groups. However, does in Group I exhibited relatively stronger estrus behavioural signs such as increased restlessness, tail wagging and standing heat. (Table 1)

The conception rate recorded was 83.33 percent in both Group I and Group II, with no pregnancy wastage observed in either group. (Table 2). Mean gestation length was 153.00±4.57 days in Group I and 151.40±3.73 days in Group II, which falls within the normal physiological range for goats. The kidding rate was 100 percent in both groups. Litter size was higher in Group I (1.33) compared to Group II (1.00). Twin births were observed only in the insulin-treated group, whereas all does in Group II delivered single kids. (Table 3)

Table 1: Effect of different estrus synchronisation protocols on estrus induction rate, time to onset of estrus and duration of estrus goats.

Group	Estrus induction rate (percent)	Time to onset of estrus (hr)	Duration of estrus (hr)
G-I	100.00	32.33±6.68	33.16±4.48
G-II	100.00	32.33±5.70	31.00±5.11

Table 2: Effect of different estrus synchronisation protocols on conception rate (%) and pregnancy wastage (%) in goats.

Groups	Conception rate (percent)	Pregnancy wastage (percent)
G-I	83.33	00.00
G-II	83.33	00.00

Table 3: Effect of different estrus synchronisation protocols on gestation length, litter size, kidding rate and sex ratio in goats.

Groups	Gestation length (days)	Litter size	Kidding rate (percent)	Sex ratio (M: F)
G-I	153.00±4.57	1.33±0.93	100.00	25:75
G-II	151.40±3.73	1.00±00	100.00	40:60

Discussion

The 100 percent estrus induction rate observed in both groups confirms the high efficacy of the Co-synch protocol in inducing estrus in goats under semi-intensive management systems (Greyling and Van Niekerk, 1986 and Pujar *et al.*, 2016) [3, 6]. The comparable onset and duration of estrus between groups indicate that insulin supplementation did not significantly alter estrus timing.

The identical conception rate in both groups suggests that insulin supplementation did not significantly influence conception rate under conditions of adequate nutrition and management. Similar conception rates following Co-synch protocol alone have been reported earlier (Pujar *et al.*, 2016 and Kanduri *et al.*, 2022) [6, 4].

Gestation length and kidding rate were unaffected by insulin supplementation, which is in agreement with earlier reports indicating that synchronization protocols do not alter gestation length in goats.

The higher litter size and occurrence of twin births exclusively in the insulin-treated group suggest a positive effect of insulin on ovulation rate and early embryo survival even-though statistically non-significant.

Conclusion

The study demonstrated that supplementation of insulin along with Co-synch protocol did not significantly alter estrus induction or conception rate in goats maintained under semi-intensive management. However, insulin-treated does showed improved estrus expression and higher litter size compared to goats treated with Co-synch alone. Integration of metabolic hormones with synchronization protocols may enhance prolificacy in goats under well-managed production systems.

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