RESEARCH ARTICLE

Influence of Different Synchronization Protocols on Fertility Response in Surti Does

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Abstract

This study was carried out to assess the influence of different estrus synchronization Protocols on fertility response in Surti does based on litter size, fecundity and twining rate. Thirty does were selected and divided into five equal groups (n=6 in each). Does of G1 group were treated with intra-vaginal progestagen sponges (IVPS) for 11 days. Does of G2 group received the same IVPS sponge for 11 days and exposure of sexually active apronized buck during the treatment period. Does of G3 group were treated as per G1 group along with i/m injection of $PGF_2\alpha$ analog (125 µg, Cloprostenol) at the time of sponge removal. Does of G4 group were subjected to the buck effect and exposed to a sexually active patronized buck for 11 days, and does of G5 group was kept as a control without any treatment for 11 days. It was found that, none of the synchronization Protocols had significant effect on litter size, fecundity, and incidence of multiple kid birth and sex ratio in Surti does.

Keywords: Estrus synchronization, Intra-vaginal progestagen sponge, Litter size, Fecundity, Twining rate.

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Introduction

Estrus synchronization in livestock is a valuable management tool in enhancing reproductive efficiency. This technique offers tight synchrony and provides an acceptable level of fertility upon artificial or natural breeding. Synchronization of estrus in does and ewes, is achieved either by extending the luteal phase artificially with exogenous progesterone or potent progestagens and/or by reducing with prostaglandin $F_2\alpha$ ($PGF_2\alpha$) or its analogs (Parmar *et al.,* 2020. Intra-vaginal progestagen sponge impregnated with MAP and FGA is a common and traditional treatment of choice in small ruminants during the breeding and anestrus seasons and offers a convenient method to administer progestagens; perhaps a more simple method might be through oral dosing in feeds, e.g., Melengestrol acetate (MGA). Estrus response and fertility vary greatly when intra-vaginal sponges are applied, dependent on species, breed, co-treatment, management, and mating system. Prostaglandin has also been used as a co-treatment in effective progestagen-based synchronization protocols in goats, sheep, and cattle for both natural and timed breeding by AI (Kusina *et al.,* 2000).

Although buck effect and conventional $PGF_2\alpha$ treatment in Surti does for synchronization of estrus have been reported to be equally effective without any difference in reproductive hormones (Chaudhary *et al*., 2017a) or estrus parameters (Chaudhary *et al*., 2017b) , many earlier studies indicated that the continuous presence of sexually active buck following estrus synchronization reduced the interval of estrus onset in does as well as reducing the duration of estrus when bucks were allowed to service the does (Mellado *et al.,*2000).

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However, the variation in the timing of estrus may need to be taken into consideration when estrus detection is carried out by using teaser bucks for AI following synchronization (Romano, 1994). Although, progress has been made toward manipulating the endocrine events to develop efficient and cost-effective methods for estrus synchronization in goat, there are still many opportunities to develop more standardized procedures to maximize the reproductive performance following synchronization.The aim of the present investigation was therefore, to study the influence

of different synchronization Protocols on fertility response in Surti does.

Materials and Methods

A total of 30 healthy non-pregnant nulliparous, primiparous, and pluriparous Surti does were selected from the University Farm Flock (AICRP on Surti Goats) of Livestock Research Station, Navsari Agricultural University, Navsari, Gujarat. The animals were randomly selected and segregated for study and were maintained on optimum nutritional and hygiene conditions. The experiment was initiated after confirmations of their non-pregnant status. All the does were screened for pregnancy diagnosis by ultrasonography and the experiment was initiated after confirmations of their non-pregnant status.

Experimental Design

Experimental goats were evenly divided into five groups, *viz*., treatment G1, G2, G3, G4 and control G5 comprised of 6 animals in each, and were managed as under.

G1 group:Animals were implanted with intra-vaginal progestagen sponges (IVPS) impregnated with 60 mg Medroxyprogesterone (MAP) for 11 days and were removed on day 11 from the vagina.

G2 group: The does received IVPS as per G1 group and were also exposed to sexually active apronized buck day and night for 11 days and both were removed thereafter.

G3 group: Does were treated as per G1 group followed by intramuscular (i/m) injection of 125 µg $PGF_2\alpha$ analog cloprostenol (Pragma® Vet., Intas Pharma, Ahmedabad, India) at the time of sponge removal.

G4 group: The does were kept with one sexually active apronized buck continuously day and night till 11 days as a teasing period, and the buck was removed on 11th day.

G5 group: Does of this group served as untreated controls without any treatment during 11 days and were used to enable comparison with the animals of different treatment groups.

Estrus detection was carried out by parading a sexually active buck for 30 minutes twice a day (morning and evening) after 11 days and visually monitoring the behavioral signs of estrus. The experimental does were bred on observed estrus by natural service with selected bucks according to breeding policy of the farm.

Pregnancy was diagnosed on the basis of non-return rate, serum progesterone level at 45th days post-service followed by abdominal palpation as well as confirmed by kidding event. The fertility response under different synchronization protocols was measured after successful kidding of the does as:

Litter size: Number of kids at birth/ Number of kidded females in each group

Fecundity: Number of kids at birth/ Number of females in estrus in each group

Single kidding rate: (Number of goats with single kid/ Number of goats kidded) x 100

Twinning rate: (Number of goats with twin kid/ Number of goats kidded) x 100

The results were obtained, and means were compared using one-way ANOVA. Means were separated using Duncan's New Multiple Range Test (DNMRT) and significant differences were declared at 5%.

Results and Discussion

The results obtained for litter size, singlet and twin birth, fecundity and sex ratio in different treatment and control groups of Surti does are mentioned in Table 1.

Conception/ Kidding Rates

The numbers of goats conceived and kidded in group G1 to G5 were 3, 5, 5, 5, and 5 out of 6 in each group with a

Table 1: Litter size, singlet and twin birth, fecundity and sex ratio in different treatment and control group of Surti does (n = 6)

	Fertility parameters					
Groups (n = 6)	*Litter size (Mean ± SE)*	*Kid birth (%)*		*Fecundity (Mean ± SE)*	*Sex ratio (%)*	
		Single birth	*Twin birth*		*Male kid*	*Female kid*
G1	1.00 ± 0.00^a	100.00 (3/3)	00.00 (0/3)	0.50 ± 0.22^a	33.33 (1/3)	66.67 (2/3)
G2	1.20 ± 0.20^a	80.00 (4/5)	20.00 (1/5)	1.00 ± 0.26^a	33.33 (2/6)	66.67 (4/6)
G3	1.40 ± 0.24^a	60.00 (3/5)	40.00 (2/5)	1.17 ± 0.31^a	71.43 (5/7)	28.57 (2/7)
G4	1.20 ± 0.20^a	80.00 (4/5)	20.00 (1/5)	1.00 ± 0.26^a	66.67 (4/6)	33.33 (2/6)
G5	1.20 ± 0.20^a	80.00 (4/5)	20.00 (1/5)	1.00 ± 0.26^a	50.00 (3/6)	50.00 (3/6)
Range	1.00 ± 0.00-1.40 ± 0.24	60.00-100.00	00.00-40.00	0.50 ± 0.22-1.17 ± 0.31	33.33-71.43	28.57-66.67
F value	0.39	--	--	0.93	--	--
P value	0.81	--	--	0.46	--	--

Means bearing common superscript (a) within a column do not differ significantly (p > 0.05).

kidding rate of 50.00% in G1 (only IVPS sponge) and 83.33% in all other groups including control. This proved that IVPS sponge alone coordinated the endocrine events and ovulatory estrus/conception in treated goats compared to an undisturbed control group and those exposed to buck or treated with sponge in combination with buck exposure or PG injection. These results, to some extent, concurred with reports of Kusina *et al.* (2000), Kausar *et al.* (2009), Parmar *et al.* (2020) in different breeds of goats by adopting different synchronization protocols.

Litter Size and Fecundity

No significant difference ($p > 0.05$) was observed in the litter size and fecundity among different groups. Earlier workers, however, reported variable litter size and fecundity such as1.22 ± 0.00 and 0.92 ± 0.01in local goats (Sunil Kumar *et al.,*2018),1.30 ± 0.50 and 1.30 ± 0.50in Beetal x Dwarf goats (Kausar *et al.,*2009),1.56 ± 0.12 and 1.12 in Criollo x Dairy breed of goats (Mellado *et al.,*2000), 1.71 ± 0.18 and 1.00 ± 0.28 in Mashona goats (Kusina *et al.,*2000), and1.36 and 1.34 in Surti goats (Parmar *et al.,* 2020), respectively, for animals synchronized by buck effect, intra-vaginal progesterone sponges alone or in combination with either buck effect or $PGF_2\alpha$ and other protocols.

Twinning and Sex Ratio

No significant difference ($p > 0.05$) was observed in the twinning and Sex Ratio among different groups. Kusina *et al.* (2000) reported 71.43% single and 28.57% twin kid birth in Mashona goats; Sunil Kumar *et al.* (2018) found 81.82% single and 18.18% twin kid birth in local goats, Kausar *et al.* (2018) reported 75% single and 25% twin kid birth in Beetal x Dwarf goats while Parmar et al. (2020) recorded 60.71% single and 39.29% twin kid birth in Surti goats following use of intra-vaginal sponges having different concentration of natural or synthetic progesterone alone or with $PGF_2\alpha$ at different interval or other protocols. Either single or twin kid birth, along with the sex ratio observed by various research workers, entirely depends on the natural prolificacy of a breed of goats used in the experiment.

The present study revealed that none of the synchronization methods had a significant effect on litter size, fecundity, and incidence of multiple kid birth in Surti. Thus, it is concluded that the intra-vaginal MAP sponges alone or in combination with either $PGF_2\alpha$ or buck effect as well as buck effect alone are equally efficient and beneficial to improve fertility parameters to some extent in Surti does.

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