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Synchronization of Estrus by 'Buck Effect' and $PGF_2\alpha$ Treatment in Surti Does

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Abstract

This investigation was aimed to study the influence of buck and $PGF_2\alpha$ treatment on estrus synchronization in Surti does. Apparently healthy non-pregnant Surti does (n=18) were identified from the flock by Ultrasonography. They were evenly divided into 3 groups, 6 does in each group. The does of Treatment T1 group were teased with a sexually-active-apronized buck; the does of Treatment T2 group were treated with $PGF_2\alpha$, i.e., Inj. Lutalyse® @ 7.5 mg/doe IM twice, i.e. on day 0^{th} and 11^{th}, while the does of Control group T3 were kept without any treatment. The behavioural estrus was successfully synchronized by double injection of $PGF_2\alpha$ at 11 days apart, as well as by buck effect in T2 and T1 groups, respectively. The induction of estrus was observed cent per cent in all the groups within one month. The mean time intervals between start of treatment and onset of estrus differed significantly between T1 (5.83±2.20 d) and T3 (14.67±2.76 d) groups. However, the mean duration of estrus was 29.83±0.91, 27.50±1.23 and 28.67±1.28 hrs and the mean number of services per conception was found 1.33±0.33, 1.50±0.50 and 1.33±0.33 for T1, T2 and T3 groups of Surti does, respectively, none differ significantly ($p>0.05$) between the groups. There was no significant difference in conception rates at first service amongst the groups (83.33%). The 17 does among 18 does (94.44 %) from all the three groups conceived within three services, irrespective of treatment groups. It was found that the buck effect appeared to be as effective as conventional $PGF_2\alpha$ treatment in Surti does for synchronization of estrus.

Key words: Buck effect, Goat, $PGF_2\alpha$, Synchronization

Introduction

Surti goat is a medium sized dual purpose breed and mostly confined to small towns and cities situated on the western coastal belt of south Gujarat and mostly reared under the semi-intensive management system. The reproduction and production performances of this goat play an important role in animal husbandry and profitable farming (Deshpande *et al.*, 2009). Goats are seasonal breeders in which fertile reproductive cycles occur when the photoperiod is decreasing i.e. during autumn and winter (Chemineau *et al.*, 2007). Induction of synchronous behavioural estrus and ovulation in anovulatory females after introduction of buck is called the buck effect (Ungerfeld *et al.*, 2004). This response is widely used to advance and synchronize breeding in goats (Veliz *et*

al., 2006). Estrus synchronization has been successfully used in enhancing reproductive efficiency, particularly in small ruminants (Kusina *et al*., 2000). The 'buck effect' is now one of the well established means of manipulating goat reproduction without using much criticized hormonal therapy. Estrus synchronization in does can be achieved either by reducing the length of the luteal phase of estrous cycle with $PGF_2\alpha$ and its analogues (Jainudeen *et al*., 2000) or by extending it artificially with exogenous progesterone (Karatzas *et al*., 1997). $PGF_2\alpha$ treatments are easily applied by intramuscular injection, avoiding problems of intravaginal devices, rapidly metabolized and avoiding chemical residues in animal products (Vazquez *et al*., 2010). Hence, the aim of this study was to examine the influence of buck and $PGF_2\alpha$ treatment on estrus synchronization in Surti does.

Materials and Methods

Selection of Surti does was done at random in the University farm and eighteen non-pregnant does were separated from the flock by ultrasonographic visualization. The animals were equally divided into 3 groups, each group consisting 6 does. The does of treatment group T1 were teased with a sexually-active-apronized buck; the does of treatment group T2 were treated with $PGF_2\alpha$, i.e. Inj. Lutalyse® @ 7.5 mg/doe IM at 0 day and 11th day, and control group T3 was kept without any treatment. The does were maintained on optimum nutritional, health care and other managemental practices as per routine farm schedule. Onset and duration of estrus were recorded for each doe in all groups and 3 bucks were allowed to mate with the does. The time interval (h) between onset of estrus and the treatment was calculated by taking difference between the recorded date and time of starting the experiment and first incidence of one or more behavioural activity characteristic to females in estrus while the duration of estrus (h) was calculated by taking difference between the recorded time of onset and end of estrus. The does were considered to be in estrus by observing two main signs, i.e. doe allowing buck to mount and vigourous wagging of tail. Similarly, the end of estrus was considered when mounting by male was not allowed and there was no wagging of tail. Conception rates were calculated on the basis of non-return rate and serum progesterone level.

Statistical analysis was carried out for onset of estrus, duration of estrus and number of services per conception between groups by using ANOVA and Student's 't' test employing SPSS software version 20.0.

Results and Discussion

The effect of treatment on synchronization of estrus, estrus onset, estrus duration and conception rates is shown in Table 1. The results revealed that the behavioural estrus was successfully synchronized by buck effect as well as double injection of PGF2α at 11 days apart in T1 and T2 groups, respectively. The signs of estrus and acceptance of buck by does were recorded at induced estrus and at natural estrus and natural service was employed in all the groups. In the present study, cent per cent result obtained on estrus induction response in Surti does under different synchronization protocols and its control groups. While Neto *et al*. (2015), Rivas-Munoz *et al*. (2007) and Veliz *et al*. (2006) reported little lower estrus induction rate of 87.00 to 96.3 % with buck effect. The buck effect had been shown as a multi-sensory phenomenon involving olfactory, visual, tactile and auditory cues. High per cent of females responds to male stimulation when all cues are active (Chemineau *et al*., 1989). The GnRH pulse generator generates intermittent GnRH discharges into the portal vessels and thereby regulates the pulsatile LH secretion into the peripheral circulation. Therefore, the central target of the buck effect pheromone was thought to be the hypothalamic GnRH pulse generator.

The 100 % does responded to the $PGF_2\alpha$ treatment with induction of estrus corroborated well with the observations of Juma *et al.* (2009) and Vazquez *et al*. (2010), while little lower estrus induction response with $PGF_2\alpha$ treatment as 95 % was reported by Khandoker *et al*. (2009) in the Black Bangal goat; Akhtar *et al.* (2014) in Nachi breed of goat.

The mean interval of induced estrus following teasing period (after 11 days) in buck effect (T1 group)

Table 1: Effect of different treatment on estrus synchronization conception rates in Surti does (Mean ± SEM)

Protocol/ Group (n=6)	Estrus Synchronization Parameters							
	Estrus induction response	Onset of estrus (days)	Duration of estrus (hrs)	Number of services per conception	Conception rate (%)			Overall conception rate
					First service	Second service	Third service	
T1 (Buck effect)	100% (6/6)	05.83±2.20[a]	29.83±0.91	1.33±0.33	83.33% (5/6)	00% (0/1)	100% (1/1)	100% (6/6)
T2 ($PGF_2\alpha$ Treatment)	100% (6/6)	10.17±3.38[ab]	27.50±1.23	1.50±0.50	83.33% (5/6)	00% (0/1)	00% (0/1)	83.33% (5/6)
T3 (Control)	100% (6/6)	14.67±2.76[b]	28.67±1.28	1.33±0.33	83.33% (5/6)	00% (0/1)	100% (1/1)	100% (6/6)
Overall	100% (18/18)	10.22±1.76	28.67±0.66	1.39±0.22	83.33% (15/18)	00% (0/3)	66.33% (2/3)	94.44% (17/18)
F value	--	5.208	0.495	0.94	--	--	--	--
P value	--	0.036*	0.491	0.06	--	--	--	--

The column means bearing different superscripts between groups differ significantly ($p<0.05$).

and after second injection of $PGF_2\alpha$ (i.e. 11th day) in treatment (T2 group) were observed to be 05.83±2.20 days and 10.17±3.38 days, respectively, while the mean interval of natural heat following 11 day in control (T3 group) was found to be 14.67±2.76 days. The mean interval for onset of estrus (05.83±2.20 days) in T1 group (buck effect) was found more or less similar to 115.0±10.4 hrs reported by Mellado et al. (2000) and 7.13±4.49 days reported by Alves et al. (2015). However, still shorter onset of estrus interval (65.00±18.50 hrs) in buck effect was reported by Islam et al. (2012) in indigenous breed of goats. The mean interval for onset of estrus (10.17±3.38 days) in T2 group (PGF2a treatment) was seen much longer than 44.4±3.36 hrs reported by Amle et al. (2015) and 39.0±9.76 hrs by Sidi et al. (2016). The longer mean duration of onset of estrus in T2 group observed may be due to non-responsiveness of $PGF_2\alpha$ treatment on three does out of total six does in T2 group that came late in estrus i.e. after 3 days of treatment. whereas, rest of three does in the T2 group came in heat within one to three days.

The mean duration of estrus in T1, T2 and T3 groups was found to be 29.83±0.91, 27.50±1.23 and 28.67±1.28 hrs, respectively (Table 1). The results obtained in T1 group corroborated with the earlier findings of Islam *et al*. (2012), while longer duration was observed by Akhtar *et al.* (2014) and Sidi *et al*. (2016). The non-significant difference in the estrus duration among all the groups in present study suggested that $PGF_2\alpha$ or buck effect did not interfere with the normal duration of estrus.

The mean number of services per conception calculated for T1, T2 and T3 group of Surti does was 1.33±0.33, 1.50±0.50 and 1.33±0.33, respectively, which did not differ significantly ($p>0.05$). In the present study, higher number of does conceived at first service as compared to second and following services might be the influence of factors that are responsible for non-significant ($p>0.05$) role among the treatment (T1 & T2) and control T3 groups. Since, gestation length is fix parameter, the number of services required for each conception influence the service period and kidding interval. The goal should be 1.5 services per conception however, two services per conception were acceptable and it was achieved in the present study.

There was no significant difference in conception rates between the groups. The conception rate was calculated on the basis of three services. After first service, 83.33% (5/6) conception rate was observed in each group, while the remaining one doe each became pregnant during third service in T3 and T1 groups. Overall conception rate was observed after third service was 94.44 %. The results showed 100% overall conception rate with three services in T1 group, which was higher than 75.00 to 90.00% obtained by Alves *et al*. (2015) during the dry and rainy season in Anglo Nubian does kept varying distance apart from bucks for 60 days before mating season, and 83.33% by Islam *et al*. (2012). The overall conception rate 83.33% obtained after three services in $PGF_2\alpha$ treatment (T2 group) was more or less in agreement with 78.90% reported by Akhtar *et al.* (2014). The difference in conception rates obtained by different workers might be due to breed, location, drug, dose and regimen in addition to feeding and management practices. Moreover, first service conception rate 83.33 % was also observed in control group in the present study suggested good feeding and management practices.

Thus, it can be concluded that the buck effect appears to be as effective as conventional PGF2α treatment in Surti goats for synchronization of estrus without any extra input.

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Conflict of Interest: Authors declare no conflict of interest for this research work.

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