

## Effect of Bull Exposure on the Post-partum Reproductive Efficiency in Cholistani Cows

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### Abstract

The present study was conducted with the objective to determine the effect of bull exposure on postpartum resumption of ovarian activity, first behavioural oestrus and conception rate in Cholistani cows. A total of 24 Cholistani cows kept at Shadabad Cooperative Livestock Farms Cholistan, Pakistan during September-2012 to January-2013, were divided into two groups. Bull exposed (BE) cows (n=18) were exposed to mature bull throughout the study period whereas bull not exposed (BNE) cows (n=6) were not. Both groups were kept under similar feeding and management conditions. The mean interval from the calving to resumption of ovarian activity was  $39.75 \pm 3.19$  days in the BE and  $49.75 \pm 2.75$  days in BNE animals ( $P < 0.05$ ). The mean interval from the calving to the first behavioural oestrus was  $46.93 \pm 0.48$  days in BE and  $57.5 \pm 1.29$  days in BNE animals ( $P < 0.05$ ). During the study period, more ( $P < 0.05$ ) cows from the BE group ( $16/18 = 88.88\%$ ) showed behavioural oestrus as compared to the BNE group ones ( $4/6 = 66.66\%$ ). The conception rate in BE and BNE cows were  $66.66\%$  and  $33.33\%$ , respectively ( $P < 0.05$ ). It was concluded that, cows exposed to the presence of bulls at early postpartum periods showed reduced intervals from the calving to resumption of ovarian activity, first behavioural oestrus and resumed cyclicity earlier.

**Keywords:** Bull exposure, Reproductive efficiency, Cholistani cow

## Cholistani İneklerde Boğa Maruziyetinin Doğum-sonrası Üreme Etkinliği Üzerine Etkisi

### Özet

Sunulan çalışma, Cholistani ırkı ineklerde doğum-sonrası ovaryum aktivitesinin yeniden başlaması, ilk östrus davranışı gösterme ve gebe kalma oranı üzerine boğa maruziyetinin etkisini belirlemek amacıyla yapıldı. Bu amaçla, Eylül 2012 - Ocak 2013 tarihleri arasında Shadabad Hayvancılık Kooperatifi Çiftlikleri, Cholistan, Pakistan'da barındırılan toplam 24 baş Cholistani ırk ineği iki gruba ayrıldı. Boğaya maruz bırakılmış (BE) inekler (n=18) çalışma boyunca ergin boğaya maruz bırakılırken, boğaya maruz bırakılmamış (BNE) inekler (n=6) böylesi bir maruziyete bırakılmadı. Her iki grup aynı besleme ve yönetim koşullarında tutuldu. Ortalama buzağılama-ovaryum aktivitesinin yeniden başlama aralığı, BE'de  $39.75 \pm 3.19$  gün iken, BNE hayvanlarda  $49.75 \pm 2.75$  gün idi ( $P < 0.05$ ). Ortalama buzağılama-ilk östrus davranışı gösterme aralığı, BE'de  $46.93 \pm 0.48$  gün iken, BNE hayvanlarda  $57.5 \pm 1.29$  gün idi ( $P < 0.05$ ). Çalışma periyodu boyunca, BNE grubundakilere ( $4/6 = 66.66\%$ ) kıyasla, BE grubunda daha fazla ( $P < 0.05$ ) sayıdaki inek ( $16/18 = 88.88\%$ ) östrus davranışı gösterdi. Gebe kalma oranı, BE ve BNE ineklerinde sırasıyla  $66.66\%$  and  $33.33\%$  idi. ( $P < 0.05$ ). Sonuç olarak; doğum-sonrası erken dönemde boğa varlığına maruz bırakılan ineklerde, buzağılama-ovaryum aktivitesinin yeniden başlaması ve ilk östrus davranışı gösterme aralığının kısaldığı ve siklisenin daha erken (yeniden) başladığı saptandı.

**Anahtar sözcükler:** Boğa maruziyeti, Üreme etkinliği, Cholistani inek



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## INTRODUCTION

Early pregnancy is the key to success of livestock production. A cow becoming pregnant in time may give birth to 7-8 calves along with that much lactation as compared to 2-3 calves per cow in her lifetime that could not conceive well in time. To reduce the calving interval, likely to be peculiarly long in some cases, pregnancy within 90 days is desired. By reducing the calving interval maximum, production and profit can be obtained thereby. The mean length of the calving intervals of a cow determines, to the large extent, her total productivity. Lesser number of days required by the cow to conceive after parturition is one of the best criteria for determining the reproductive ability under the range conditions. When active and fertile bulls are present, the average interval from parturition to the conception of a viable embryo reflects the postpartum interval to an ovulatory oestrus and the fertilisation and embryonic survival rate. This interval thus determines the length of the breeding season necessary to obtain a satisfactory calf crop <sup>[1]</sup>.

The biostimulatory effect of male on oestrus and subsequent ovulatory response has been reported in many species. For a superior herd management, a bull is kept along with buffaloes resulting in the reduction of postpartum interval to oestrus <sup>[2]</sup>. Several studies similarly reported that cows come into oestrus earlier by exposing with a vasectomized bull in comparison to cows that were not exposed to Bull et al. <sup>[3,4]</sup>.

A postpartum cow exposed to bull by physical contact or separated by fence-line <sup>[5]</sup> results in an early ovarian activity. This phenomenon is called as "biostimulatory effect of bull" and is interacted by pheromones secreted in the environment through the excretory products of male <sup>[3]</sup>.

The biostimulatory effect of bull on the cow's ovarian activity also depends upon the duration of daily exposure. Fernandez et al. <sup>[6]</sup> reported that the interval from calving to resumption of ovarian activity was not hastened in cows exposed to bulls for 2 h after every 3<sup>rd</sup> day for 18 days starting 33 days after calving as compared to cows exposed to bulls continuously. Though, postpartum anoestrus was decreased in cows that were exposed by the excretory products of bulls daily for 12 h <sup>[7]</sup>.

There is limited information regarding the biostimulatory effect of bull on the postpartum resumption of ovarian activity in Cholistan cows. The present study was therefore designed with the objective to know the effect of bull exposure on the postpartum ovarian activity, postpartum oestrous behaviour and conception rate in Cholistan cows.

## MATERIAL and METHODS

The study was conducted at Shadbad Cooperative

Livestock Farms (SCLF), Cholistan, Division Bahawalpur. Cholistan is a vast desert located between latitude 29.41 and longitude 72.24. The study was completed in 150 days. The experimental period extended from September-2012 to January-2013.

A total of 24 post partum Cholistan cows were used in this experiment. The animals aged between 5-8 years with body weights (post-calving) varied from 400 to 470 kg. Cows were in their 2<sup>nd</sup> lactation without having any previous calving problems and with similar gestational lengths. These cows were randomly divided into two groups. Eighteen post partum cows were exposed continuously to the presence of bull (BE) while six of them were not exposed to the bull (BNE). The cow to bull ratio provided to the BE cows was 18:1 while the BNE cows were kept as control (no bull). It was also assured that no bull should be present in 5 km radius of the BNE cows. The BE cows were kept at Shadbad Cooperative Livestock Farms, Chapu, whereas the BNE cows were kept at Shadbad Cooperative Livestock Farms, Mouj Garh. Distance from both locations was approximately 38 km. Both groups were provided with free access to water and salts. Housing conditions at both sites were similar. Both groups were kept in semi stall fed type shed. The environmental conditions were the same at both locations, whereas feeding practices were also kept the same during this period. Both groups were provided with the same feed (two kg concentrates and grazing on the same type of pasture i.e. *Medicago sativa*). The experiment was initiated one week after the parturition. In the BE cows, the intact bull remained present in the herd while grazing and being at shed throughout the study period. In these cows the bull was restricted not to serve the cows by tying his fore legs in a traditional manner. The BNE cows served as control and had no contact with bull or its excretory products.

Postpartum oestrus detection was initiated 5 days after the start of experiment in each group. Oestrus detection was performed twice daily (7:00 am and 6:00 pm) by visual examination to observe behavioural signs during the experiment. After the detection of oestrous symptoms, cows were inseminated artificially. The artificial insemination (AI) was done by "am and pm" rule. Frozen-thawed semen from a single bull belonging to Semen Production Unit, Qadirabad was used in this study and all the cows in oestrus were inseminated by the same technician. Inseminated cows in the BE and BNE were checked for pregnancy after 60 days for a possible re-insemination, through rectal palpation.

The following parameters were studied and recorded during the experiment:

1. Intervals from the calving to resumption of ovarian activity (days),
2. First behavioural oestrus (days),

3. Number of cows showing oestrus/group,
4. Conception rate (%).

The following criteria were used to characterize the resumption of postpartum oestrous cycles:

- 1) Displaying behavioural oestrus.
- 2) Presence of a palpable corpus luteum.

Daily blood samples were taken from the BE and BNE cows through jugular venipuncture and its serum was then aspirated. To determine the interval from the calving to resumption of ovarian activity, serum progesterone concentrations were measured through ELISA by using commercially available kit (BioCheck, Inc. Foster City, USA). The limit of sensitivity was 0.3 ng/ml as indicated by the manufacturer. Inter- and intra-assay coefficients of variations were 12.6 and 7.1%, respectively. All samples were processed in one batch; thus, the coefficient of variance inter-assay was zero. Once a rise of progesterone above 1 ng/ml was determined and a luteal structure was observed by rectal palpation, an interval from the calving to the corresponding day of the progesterone rise was calculated.

Pregnancy diagnosis was confirmed by presences of foetus and corpus luteum. Detection of oestrous was performed by visual exposure of oestrous symptoms.

### Statistical Analysis

Data regarding the resumption of ovarian activity and first behavioural oestrus were determined by ANOVA whereas the conception rate was determined by Chi square test [8].

## RESULTS

The mean interval from the calving to resumption of ovarian activity was  $39.75 \pm 3.19$  days in the BE and  $49.75 \pm 2.75$  days in the BNE cows ( $P < 0.05$ ). The mean interval from the calving to first behavioural oestrus was  $46.93 \pm 0.48$  days in the BE and  $57.5 \pm 1.29$  days in the BNE animals ( $P < 0.05$ ) (Table 1).

During the study period (approximately 150 days) more cows from the BE group (16/18=88.88%) showed behavioural oestrus signs as compared to the BNE group (4/6=66.66%). In the present study, the conception rate in the BE and BNE cows were 66.66% and 33.33%, respectively ( $P < 0.05$ ) (Table 2).

## DISCUSSION

There was a marked difference between the BE and BNE cows for the interval from calving to resumption of ovarian activity. These findings are in agreement with

**Table 1.** Interval (Mean  $\pm$  SE) from the calving to the resumption of ovarian activity and the interval from calving to the first behavioural oestrus in the BE and BNE cows

**Tablo 1.** BE ve BNE ineklerde buzağılama ve ovaryum aktivitesinin yeniden başlaması ile buzağılama ve ilk östrus davranışı aralıkları (Ortalama  $\pm$  SE)

Parameters Studied	BE (n=18)	BNE, Control (n=6)
Interval from the calving to the resumption of ovarian activity(days)	39.75 <sup>a</sup> $\pm$ 3.19	49.75 <sup>b</sup> $\pm$ 2.75
Interval from calving to the first behavioural estrus (days)	46.93 <sup>a</sup> $\pm$ 0.48	57.5 <sup>b</sup> $\pm$ 1.29

Values with different superscripts in a row differed significantly ( $P < 0.05$ )

**Table 2.** Conception rate (%) in the bull exposed (BE) and the bull not exposed (BNE) cows

**Tablo 2.** Boğaya maruz bırakılan (BE) ve bırakılmayan (BNE) ineklerde gebe kalma oranı (%)

Parameter Studied	BE (n=18)	BNE, Control (n=6)
Conception rate (%)	66.66 <sup>b</sup>	33.33 <sup>a</sup>

Values with different superscripts in a row differed significantly ( $P < 0.05$ )

those of Fike et al.<sup>[9]</sup> and Gifford et al.<sup>[10]</sup> while differed from those of Sipka and Ellis<sup>[11]</sup> who reported that in high-producing multiparous Holstein dairy cows, postpartum ovarian reactivation occurred later in bull-exposed treatments as compared to the cows not exposed to bull treatment. The inconsistency between the present study with the findings of Shipka and Ellis<sup>[11]</sup> may be due to high nutritional demands of dairy breed<sup>[12]</sup> and the intensity of bull exposure<sup>[9]</sup>.

Further marked difference was observed between the BE and BNE cows for interval from calving to first behavioural oestrus. These findings corroborated with those of Barman et al.<sup>[13]</sup>. Findings of the present study are also in agreement with those of Naasz and Miller<sup>[14]</sup>, who reported that spring calving beef cows exposed to the bull returned to oestrus at  $42.2 \pm 3.1$  days after calving, whereas in cows not exposed to bull the interval was  $58.3 \pm 4.7$  days. In their study, the bull exposed cows returned to oestrus 16 days earlier than cows not exposed to bull.

Knowledge about the mechanisms by which bull-exposure may reduce the intervals from calving to resumption of reproductive cyclicity and to first postpartum oestrus remains limited. A pheromonal signal driven out by body fluids or excretory products has been emphasized to be responsible for triggering the biostimulatory effect in cattle<sup>[3,15]</sup>. Although pheromonal signals from urine and sebaceous glands have been reported in other species<sup>[16]</sup>, in cattle, both the route of emission and mechanism of chemo-signal remain unknown. The reception and transport of the pheromonal signal is probably initiated via olfaction through the

vomeroneasal organ<sup>[17]</sup>. However, the mechanisms involving the posterior internalization and translation of the pheromonal signal into the endocrine system currently remain unknown.

Hernandez et al.<sup>[18]</sup> also reported that greater proportion of cows exposed to bull showed oestrus behaviour (97%) in comparison with control cows (80%). The findings of the present study are in agreement with those of Rekwot et al.<sup>[15]</sup>. Possible reason for these findings depends on the biostimulatory effect of bull-presence to resume the cyclicity early<sup>[18]</sup>.

In the present study, the conception rate in the BE cows was markedly higher than that of the BNE cows. Berardinelli et al.<sup>[7]</sup> also reported 57.6% and 35.6% conception rate in cows exposed to bull and controls. However, contrary to the present study, Ahmad et al.<sup>[19]</sup> reported that the conception rate did not differ significantly between male-treated and control groups. However, they exposed the cow with bull's urine (treatment group) and with water (control group) instead of the exposure of cows directly with bull. Undoubtedly the, stimulatory effect of bull is also influenced by the intensity of contact (the frequency of contact, duration of contact as well as the quantity of stimuli) of pheromones fabricated by bulls<sup>[5]</sup>.

It is concluded that cows exposed to the physical presence of bulls at early postpartum periods showed reduced intervals from the calving to resumption of ovarian activity, first behavioural oestrus and resumed cyclicity earlier. There appeared favourable effect of bull exposure in improving the reproductive efficiency in Cholistani cows. Therefore, it was suggested that male animals have to be provided in the herd to improve the reproductive potential of Cholistani cows.

Some breeders consider male animals as a burden to their economical livestock production due to their feeding and management cost and consider the AI as an economical substitute to the male animal. Nevertheless, it appears that the presence of bull(s) would also be profitable for the breeder in terms of reproductive efficiency of cows. In this sense, both bull-exposure (without mating) and practising AI would likely to be worth combining to see if any superior outcome might be achieved thereby.

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