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# Seasonal Variation in Sexual Behaviour of Deoni (*Bos indicus*) Bulls

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## ABSTRACT

**Background:** Sexual behaviour is an intricate process, controlled by the endocrine constitution of an animal and influenced by the social environment, sensory capability and sexual stimuli. Variations in temperature associated with global warming are startling for fertility of animals. The objective of the present study was to assess the seasonal variation in sexual behaviour of Deoni (*Bos indicus*) breeding bulls.

**Methods:** A total of six mature Deoni bulls, maintained for artificial insemination at Livestock Research Center, Southern Regional Station of ICAR-NDRI, Bengaluru, were monitored for sexual behavior during the semen collection at weekly intervals throughout the year using standard techniques. The period of study was divided into three seasons *i.e.*, winter (November to February), summer (March to June) and rainy (July to October).

**Result:** The season had a non-significant (P>0.05) effect on sexual behavior except dismounting time in Deoni bulls. The libido score (0-10), reaction time (seconds) and the total time taken in mounting (seconds) were non-significantly (P>0.05) higher during winter (7.50±0.23, 42.00±4.8, 44.00±4.8, respectively) as compared to the other seasons. The protrusion score (0-4) and the intensity of thrust (0-4) were non-significantly (P>0.05) higher during summer (2.60±0.14 and 2.50±0.13) as compared to the other seasons. The dismounting time (seconds) was significantly (P<0.05) higher during summer (2.90±0.16) as compared to the other seasons. It can be concluded that Deoni bulls had good sexual behavior throughout the year, however, bulls showed better sexual behavior except for dismounting time during winter as compared to the other seasons.

**Key words:** Deoni bulls, Season, Sexual behaviour.

## INTRODUCTION

The reproductive ability of any breed depends on its capability of the full expression of its genetic traits in given environmental circumstances and is considered one of the crucial selection criteria for the breeding purpose (Elrabie, 2017). Fertility is one of the important aspects of bull's performance for preservation of its germplasm (Naha *et al*., 2017). The requirement for frozen semen from superior indigenous bulls is increasing rapidly in India over the recent years due to their better milk quality, adaptability to hard climate and acceptability to poor quality feed and fodders resources (Deka *et al.,* 2019). To achieve the required target of superior frozen semen with better fertility breeding soundness evaluation of bulls is crucial, for which sexual behavior of breeding bulls must be studied (Solanki *et al*., 2019). Libido in bulls is a heritable trait. Aggressive and effective breeders are likely to produce offspring that are also superior breeders. Sexual behaviour is a very complex process, controlled by the endocrine constitution of an animal and affected by the social environment, sensory capability and sexual stimuli (Naskar and Nagpaul, 2005). The genetic diversity of indigenous cattle is because of the process of rearing over the centuries (Srivastava *et al.,* 2019). These cattle have physiological advantages over exotic cattle that include greater resistance to heat, less susceptibility to ticks and tick-borne diseases, drought-tolerant and resistance to trypanosomosis (Nyamushamba, 2017). However, rearing indigenous bulls up to semen collection involve a long duration of times since large variability exist in age at puberty and sexual maturity of these bulls (Varghese *et al*., 2019). Deoni is an important dual-purpose breed of indigenous cattle found northern part of Karnataka, the southeastern part of Maharashtra and Medak district in Telangana. Deoni cattle are reported to be developed

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from a strain descended from a cross of Gir, Dangi and local cattle (Dangarpatti). Deoni bullock is good for heavy work and is especially suitable for intensive cultivation. Male fertility is a crucial factor since a lot of dams are to be bred by a single sire. In the present era, the bull is considered more than half of the herd due to intensively used for AI of frozen semen. Heat stress is occurred by a combination of temperature, relative humidity (RH), solar radiation, air movement and precipitation (Igono *et al.,* 1992). Alterations in temperature associated with global climatic change are alarming for animal fertility (Luceno *et al.*, 2020). Hence, the present study was carried out to estimate the effect of seasonal variation on the sexual behaviour of Deoni bulls.

## MATERIALS AND METHODS

The present study was conducted on six sexually mature and healthy Deoni bulls, maintained at the Livestock Research Center, Southern Regional Station of ICAR-NDRI, Adugodi, Bengaluru, located in Southern India on the Deccan Plateau, at a height of over 900 meters above the sea level (12°58′44.83″ North and 77°35′28.68″ East) during 2020-21. The study period was divided into three seasons *i.e*., winter (November-February), summer (March-June) and rainy (July-October). All the bulls were monitored for sexual behavior *i.e.*, libido score (LS), protrusion score (PS), Intensity of thrust (ITS), reaction time (RT), dismounting time (DT) and total time taken in mounting (TTTM), during semen collection at weekly interval throughout the year.

### Libido score

Libido is the willingness and eagerness of a male to mount and attempt service on the female. The libido scorecard was used as described by Chenoweth *et al.* (1979).

### Protrusion score

After the erection of the penis, the bull protrudes its penis a few centimeters from the prepuce before mounting and immediately after mount; the penis searches the vagina by the penile movement for intromission. The extent of protruding penis during seeking was observed and recorded as described by Joshi and Kharche (1992).

### Intensity of thrust

After intromission of the penis, a force was released by the bull for further insertion of the penis into the vagina just before ejaculation. The release of thrust was observed and recorded as described by Joshi and Kharche (1992).

### Reaction time

The time taken by the bull from 1.5 meters away from the dummy bull to complete his first service was considered as reaction time and was recorded using a stopwatch.

### Dismounting time

After ejaculation, the time taken by the bull to dismount from the dummy bull was considered as dismounting time and recorded using a stopwatch.

### Total time taken in mounting

Time taken by the bull from seeking of dummy bull to dismounting was considered as the total time taken and recorded using a stopwatch.

All bulls were maintained in individual housing and provided a 3 kg concentrate ration (21% crude protein, 70% total digestible nutrients) per bull per day along with any one of the seasonal green fodders such as maize, napier, sorghum and ragi straw, *etc*. as per their availability. All bulls had free access to drink clean water throughout the day. Each bull pen had half-covered space and half-open for proper ventilation and sunlight. Each bull pen was cleaned twice daily in the morning and evening. All bulls were provided adequate exercise one day before semen collection to maintain sexual behavior.

### Statistical analysis

The data was collected as repeated measurements over time. The data of seasons (winter, summer and rainy) and sexual behavior (Libido, protrusion, intensity of thrust, reaction time and total time taken in mounting) were subjected to analysis using SPSS 20.0. The One-Way ANOVA was used to determine the effect of season on sexual behavior. The test of significance was chosen at 5 per cent ($P<0.05$).

The statistical model, which was used to estimate the effect of season on the sexual behavior of Deoni bulls is given below:

$$Y_i = \mu + T_i + e_i$$

Where,

Yi = Dependent variable. (Libido score, protrusion score, the intensity of thrust, reaction time, dismounting time and total time taken in mounting).

$\mu$ = Overall mean.

$T_i$ = Fixed effect of the season (summer, rainy and winter).

$e_i$ = Random error.

## RESULTS AND DISCUSSION

The sexual behavior of Deoni bulls was recorded at the time of semen collection. The overall means of LS (0-10), PS (0-4), ITS (0-4), RT (seconds), DT (seconds) and TTTM (seconds) were 7.12±0.16, 2.59±0.07, 2.48±0.07, 38.97±2.43, 2.51±0.07 and 40.65±2.42, respectively in Deoni bulls (Table 1). The analysis of variance revealed that the season had a non-significant effect on sexual behavior except the DT.

In the present study, the overall mean value of LS in Deoni bulls was 7.12±0.16, which is similar to the report of Elrabie *et al.* (2008) in Sahiwal bulls (7.07±0.08), Syarifuddin *et al.* (2016) in Bali cattle bulls (7.20±1.49), Reddy and Sasikala (2013) in Sahiwal bulls (6.97±0.18). The season had a non-significant effect on LS in Deoni bulls (summer-7.00±0.35, rainy-7.00±0.26 and winter-7.50±0.23). The results of the present study are in agreement with the report (Mahmood *et al.,* 2013) in Cholistani artificially inseminated bulls (autumn-3.49±0.07, winter-3.50±0.07, dry summer-3.47±0.07 and wet summer-3.48±0.08). On the contrary, Deka *et al.* (2019) observed the significant effect in Kankrej bulls (summer-6.70±0.18, monsoon-6.20±0.23 and winter-5.70±0.19), Solanki *et al.* (2019) in Gir bulls (summer-

5.23±0.22 and winter-5.96±0.22) and Ahmad *et al.* (2005) in Sahiwal bulls (spring-3.39±0.21, summer-2.95±0.19, autumn-3.32±0.19 and winter-3.37±0.21).

The overall mean value of the protrusion score in Deoni bulls was 2.59±0.07, which is similar to the report of Reddy and Sasikala (2013) in Sahiwal bulls (2.58±0.14), Elrabie (2017) in Sahiwal bulls (2.63±0.08) and Elrabie *et al.* (2008) in Sahiwal bulls (2.69±0.05). In the present study, we found that the season had a non-significant effect on the protrusion score in Deoni bulls. The findings of the present study are similar to the report of Deka *et al.* (2019) who also found a non-significant effect of the season in Kankrej bulls (summer-2.94±0.03, monsoon- 2.92±0.03 and winter- 2.84±0.05). However, Solanki *et al.* (2019) found that the season had a significant effect on protrusion score in Gir bulls (summer-2.68±0.07 and winter- 2.96±0.43).

The overall mean value of the intensity of thrust in Deoni bulls was found to be 2.48±0.07, which is higher than reported by Reddy and Sasikala (2013) in Sahiwal bulls (2.33±0.21), Elrabie (2017) in Sahiwal bulls (1.80±0.19) and Singh *et al.,* (2013) in Murrah buffalo bulls (1.80±0.19) and lower than reported by Reddy and Sasikala (2013) in Jersey × Sahiwal crossbred bulls (3.46±0.08), Deka *et al.* (2019) in Kankrej bulls (3.42±0.06), Elrabie *et al.* (2008) in Sahiwal bulls (2.69±0.05) and Singh *et al.* (2015) in Sahiwal bulls (2.62±0.07). We observed that the season had a non-significant effect on the intensity of thrust in Deoni bulls. The results of the present study are in agreement with the report of Deka *et al.* (2019) in Kankrej bulls (summer-3.53±0.09, monsoon-3.47±0.09 and winter-3.27±0.11) and Solanki *et al.* (2019) in Gir bulls (summer-3.19±0.11 and winter-3.40±0.39).

The overall mean value of the reaction time (seconds) in Deoni bulls was 38.97±2.43. The finding of the present study is in agreement with the report of Singh *et al.* (2013) on Murrah buffalo bulls (40.00±1.89). The season had a non-significant effect on the reaction time in Deoni bulls. The results of the present study are in agreement with the report of Deka *et al.* (2019) in Kankrej bulls (summer-120.14±08.24, monsoon-108.94±09.23 and winter-107.53±08.98), Mahmood *et al.* (2013) in Cholistani bulls (autumn-4.59±0.66 minutes, winter-3.82±0.51 minutes, dry summer-5.11±0.66 minutes and wet summer-4.89±0.60 minutes) and Ahmad *et al.* (2005) in Sahiwal bulls (spring-2.46±0.43 minutes, summer- 2.78±0.41 minutes, autumn-2.54±0.65 minutes and winter- 2.75±0.52 minutes). On the contrary, Solanki *et al.* (2019) found that the season had a significant effect on the reaction time (summer-153.54±4.82 and winter- 128.09±4.24).

The overall dismounting time (seconds) in Deoni bulls was 2.51±0.07. The finding of the present study is in agreement with the report of Reddy and Sasikala (2013) in Jersey × Sahiwal crossbred bulls (2.67±0.15). In the present study, we found that the season had a significant effect on the DT. The DT was significantly (P<0.05) higher in summer (2.90±0.16) as compared to the rainy (2.50±0.09) and the winter (2.10±0.08) seasons.

In the current study, the overall mean value of the total time taken in mounting (seconds) in Deoni bulls was 40.65±2.42, which is similar to the report of Reddy and Sasikala (2013) in Jersey × Sahiwal crossbred bulls (36.75±5.24). In the present study, the season had a non-significant effect on the TTTM in Deoni bulls. The results of the present study are in agreement with the report of Deka *et al.* (2019) in Kankrej bulls (summer -175.20±11.00, monsoon -155.30±10.70 and winter -166.50±12.20).

The overall mean value of LS in Deoni bulls showed that the bulls were very active while semen collection and demonstrated pronounced libido. The difference in the libido score may be due to the use of different score cards and alterations in climatic conditions in the study location. The breed of the bulls, good housing and management practices followed at the study farm (Livestock Research Center) and comfortable climatic conditions throughout the year at the time of semen collection may be responsible for the non-significant difference in LS. The average value of PS found in the present study indicated that the Deoni bulls showed good to the very good protrusion of the penis from the prepuce. The higher PS of young bulls than the adult may be due to attainment of the maturity of tissues in reproductive organs and less expression of sexual performance was due to the aging process which results in lethargy and reduction in vigor. The overall mean value of ITS found in the present study indicated that the Deoni bulls exhibited good to very good thrust. The age and height of the bulls and high stimulation at the time of semen collection may be causative factors for variation in the intensity of thrust.

The average value of RT showed that the Deoni bulls were active and had high sexual stimulation before semen collection which means that better housing and management practices were followed for bulls. The difference in RT reported in different studies might be due to the age of bulls, climatic conditions and variation in the recording of the reaction time. The overall mean value of DT and TTTM found in the present study showed that the Deoni bulls were very quick to dismount dummy after ejaculation and rapidly during

**Table 1:** Effect of season on the sexual behavior of Deoni bulls (Mean±SE).

| Season | Libido score (0-10) | Protrusion score (0-4) | Intensity of thrust (0-4) | Reaction time (seconds) | Dismounting time (seconds) | Total time taken in mounting (seconds) |
|---|---|---|---|---|---|---|
| Overall | 7.12±0.16 | 2.59±0.07 | 2.48±0.07 | 38.97±2.43 | 2.51±0.07 | 40.65±2.42 |
| Summer | 7.00±0.35 | 2.60±0.14 | 2.50±0.13 | 37.00±3.9 | 2.90±0.16$^{a}$ | 39.00±3.9 |
| Rainy | 7.00±0.26 | 2.60±0.14 | 2.50±0.13 | 39.00±4.1 | 2.50±0.09$^{ab}$ | 40.00±3.9 |
| Winter | 7.50±0.23 | 2.50±0.12 | 2.40±0.15 | 42.00±4.8 | 2.10±0.08$^{b}$ | 44.00±4.8 |

*Means with different superscripts in columns differ significantly (P<0.05).

semen collection. The difference in age and breed of the bulls, management practices and recording of the time may be responsible factors for variation in DT and TTTM reported by different researchers.

## CONCLUSION

Deoni bulls were docile and exhibited steady movement at the time of semen collection. Deoni bulls were very active and showed pronounced libido. The protrusion was observed between fair to good. Deoni bulls showed good to very good intensity of thrust. The season had a non-significant effect on sexual behavior except for the dismounting time (seconds), which was found to be significantly higher in summer (2.90±0.16) compared to the rainy (2.50±0.09) and winter (2.10±0.08) seasons. It can be concluded that continuous monitoring of the sexual behavior is crucial to address the impact of seasonal changes on the sexual behavior as well as the reproductive performance of indigenous cattle bulls and can be used as an important factor to improve the selection of breeding bulls.

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**Conflict of interest:** None.

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