

STUDIES ON SEXUAL BEHAVIOUR IN FEMALE DROMEDARY CAMEL (*Camelus dromedarius*)

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ABSTRACT

Sexual behaviour of female dromedary camel was studied to understand various behavioural expressions and to determine the receptivity pattern in the presence of a male camel. The intensity and expression of various behaviours before and during mating were recorded from 08:00 to 16:00 hours daily for 25 days during breeding season in 10 female camels. Females showed irregular pattern of sexual behaviour without any definite period of receptivity. Majority (70%) of females remained sexually active during most of the study duration with intermittent period of quiescence, while others (30%) remained indifferent to male most of time but suddenly showed receptive behaviour and mated. The intensity of various behaviours was weak on most of the occasions. No behaviour could be related to selection of female for mating, however, approached by the male, coming closer to the male and restlessness were most frequently observed behaviours in selected females on the day of mating. Swelling of vulva, vaginal mucous discharge and frequent micturition could not be observed distinctly. We concluded that signs of sexual behaviour were unreliable in determining the timing of breeding or insemination as camels did not exhibit distinct periods of overt oestrus or sexual receptivity.

Key words: Dromedary camel, expression, mating, sexual behaviour

The reproductive physiology of camelids differs from that of other domestic livestock in many aspects. Female camels are induced ovulators and unmated female exhibit continuous renewing of terminally growing follicles defined as follicular waves (Skidmore *et al*, 1996; Manjunatha *et al*, 2012). They do not have regular oestrous cycles that are typical of spontaneous ovulators. Therefore, camels do not exhibit distinct periods of overt oestrus as do other farm animals such as cattle and sheep (Skidmore, 2011). There are no reliable signs of oestrus which is one of the factors accountable for the poor reproductive efficiency in camel (Tibary and Anouassi, 1997).

Camel breeding in the farm and field is usually done by mating randomly selected female camel without observing sexual behaviour. This is based on the assumption that a mature follicle is always present during the breeding season that will ovulate in response of mating (Purohit and Pareek, 2000). However, such assumptions are not always correct as many times a follicle present may not be of ovulating size (Vyas and Sahani, 2000).

Several authors have described signs of sexual receptivity or oestrus behaviour in dromedary camels such as chasing and mounting other females,

restlessness, swelling of the vulva, straddling the hind legs, urination, vaginal mucous discharge and adopting sitting posture near the male (Novoa, 1970; Joshi *et al*, 1978; Wilson, 1984). Most studies on sexual behaviour in female camel which were done before 90'S were on the premise that there is a distinct oestrus phase as in other farm animals (Yasin and Wahid, 1957; Singh, 1966; Nawito *et al*, 1967; Novoa, 1970; Joshi *et al*, 1978; Musa and Abusineina, 1978; Wilson, 1984). However, there is paucity of detailed studies on sexual behaviour. Considering the fact that camels have neither defined oestrus cycle nor distinct oestrus phase, the objective of the present study was to determine the pattern of various sexual behaviours in female camels in the presence of male camel.

Materials and Methods

The present study was conducted on Bikaneri camels maintained at National Research Centre on Camel, Bikaner, India, during winter 2013 which is the period of breeding season for camels in India. Bikaner is located on 27.9779°N latitude and 73.3606°E longitude at an altitude of 242 meters above the mean sea level in the middle of Thar desert. The temperature ranged between 7-35°C during the behavioural study. Investigation was conducted on

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10 apparently healthy female dromedary camels selected from institute farm and observed for the sexual and mating behaviour for 25 days (Feb 14-March 10, 2013). Rectal and ultrasound examination of the reproductive tract were done to rule out abnormalities. A proven virile male camel was selected for mating. Ultrasound scan was done on the day of mating to see the ovarian status.

The animals were maintained in loose but under intensive management system and housed in a large barn of 80 ft x 80 ft size with sandy floor surrounded by brick-cement walls of 14 ft height to prevent any disturbance from other camels. The system of housing facilitated free movement, mating and their easy identification during different activities. The animals were fed as per the standard feeding practices employed in the NRCC farm. Ration containing green and dry fodder and *ad libitum* access to water twice a day. The male camels were kept away from female barn. The virile male camel was left into the barn of female herd from 08:00 to 16:00 hours daily. Female camels were monitored for sexual behaviour before and during mating and the observations were manually recorded on behavioural chart. The

ethograms of sexual behaviour of female camels before and during mating are shown in tables 1 and 2, respectively.

Different pre-mating behaviours shown by the female were assigned a score depending upon the frequency or intensity of the expression. Each behaviour was scored on a scale of 1-3 which represents the frequency/degree as weak, moderate and intense, respectively. When a behaviour was not recorded, the score was considered zero.

Results

Female camels did not show any particular duration of receptivity or oestrus as shown in other farm animals. Around 30% females (3/10) remained sexually active up to 15 days with intermittently indifferent behaviour to the male, while others 40% (4/10) expressed good signs of receptivity for up to 5 days, became quiescent for 2-3 days and again started to show sexual behaviours. About 30% (3/10) female camels remained quiet most of days and suddenly adopted sitting posture without showing other signs of receptivity and were selected by the male for mating. The sexual activity of females diminished 2-3 days after the mating.

Table 1. Ethogram for pre-mating sexual behaviour in female camels.

Behaviour	Definition
Coming closer to the male	The female follows the male, comes near and remains in close proximity.
Approached by the male	The male chases the female, comes near and stand by it.
Restlessness	The female gets excited in presence of male, jumps, runs and try to get close of male or other females.
Bleating or bellowing	Vocalisation pattern in which female emits a hollow sound.
Sniffing genitalia and perineal region of male	The female sniffs the perineal region of the male for more than 5 seconds.
Frequent urination	The female urinates at an interval of every 10-15 min.
Restlessness on viewing mating	Excitement on viewing mating, jumping, comes close to mating couple, tries to force out the male and bites mating male or female.
Mounting other females	The female orients herself behind another sitting female, then brings her body above that of the other female and attempts to sit or sits over it by clasping with front legs. The mounting female may or may not show thrusting.
Swelling of vulva	Vulva becomes swollen and oedematous giving the ano-genital region a rounded shape.
Vaginal mucous discharge	Clear, transparent and viscoelastic secretion visible on the vulvar opening.
Adopting sitting posture	The female acquires sitting posture near or far from male, on approaching by male it either stands up and evades mounting or remain sitting and allow the male to mount over it and mate.

Table 2. Ethogram for mating behaviour in female camels.

Behaviour	Definition
Female behaviour	
Keeping tail aside	After mounted by the male, female keeps the tail off the genitalia and allow the male for intromission.
Biting the male	Female attempts to bite or sometimes bites the copulating male on his neck, shoulders or legs.
Grunting	Vocalisation pattern in which female emits a cry-like deep sound.

Pre-mating sexual behaviour pattern of female camels is presented in table 3. In majority of the observations, expression intensity of the most of the behaviours was weak. Coming closer to the male, approached by the male and restlessness were the most frequently observed behaviours. Restlessness in the female camels on viewing mating of other herdmates and mounting other females were found to be interesting behaviours and the intensity of these behaviours was strong, whenever expressed. Swelling of vulva and vaginal mucous discharge was not observed in any female during study period. Females adopted sitting posture near the male for 63 times during the study but the proportion of females mated after acquiring mating stance was quite low and only 13 times (20.63%) mating took place in 8 females. The male showed predilection towards 2 females and repeatedly mated them whenever these females adopted sitting posture, even in the presence of corpus luteum. Male selected the females irrespective of the sexual behaviours expressed by the female, such as some females showing good sexual activity were ignored, while other females expressing no sexual behaviour were selected by the male.

Sexual behaviour of female camels during mating (Table 4) and various parameters of mating behaviour (Table 5) are presented below. After

adoption of sitting posture by the female, male directly mounted over the females within average 13 ± 2.71 s. Courtship behaviour and Flehmen's reaction was not expressed by the male camel before commencement of the mating; however, Flehmen's reaction was seen after sniffing ano-genital region and urine of the female camel often. Displacement of tail by female camel following mounting allowing intromission of the penis was seen in 84.62% (11/13) matings. The grunting sound, a cry like vocalisation, was observed only in 2 females in the presence of corpus luteum which were mated a few days back. The intensity of mating behaviour of the male camel was not related to the receptivity or intensity of sexual behaviour of female.

Discussion

In the present study, unmated females remained sexually receptive most of the days without any definite period, unlike other farm animals. The finding is in contrast to the observation of other investigators who observed 3-6 days of oestrus phase in female dromedaries (Nawito *et al*, 1967; Joshi *et al*, 1978; Elias *et al*, 1985; Homeida *et al*, 1988). However, it is supported by the studies of Skidmore *et al* (1995; 1996) who reported no particular phase of sexual receptivity in female camels. The variability that exists in both the duration and regularity of receptivity

Table 3. Intensity of pre-mating sexual behaviour (%) in female camels.

Behaviour	Total observations (n)	Intensity (%)		
		Weak	Moderate	Intense
Coming closer to the male	65	72.31	23.08	4.62
Approached by the male	66	62.12	27.27	10.61
Restlessness	58	62.07	18.97	18.97
Bleating or bellowing	21	66.67	19.05	14.29
Sniffing genitalia of the male	29	82.76	17.24	0.00
Frequent urination	1	-	-	100
Restlessness on viewing mating	42	45.24	23.81	30.95
Mounting other females	12	33.33	16.67	50.00
Swelling of vulva	0	-	-	-
Vaginal mucous discharge	0	-	-	-
Acquiring sitting posture	63	63.49 ^a	15.87 ^b	20.63 ^c

^aMounting did not occur as either male did not approach the sitting female or female stood up on approached by the male.

^bMale mounted the female but copulation did not occur.

^cCopulation completed.

Table 4. Sexual behaviour of female camels during mating[§].

Behaviour	Keeping tail aside	Attempting to bite the male	Grunting
Per cent expression	84.62 (11/13)	38.46 (5/13)	15.38 (2/13)

[§] Based on a total of 13 matings from 8 females # Figures in parentheses indicate the number of observations

Table 5. Various parameters of mating behaviour in dromedary camel.

Parameters	Mean±SEM [§]	Range
Onset of mating after entry of male (min)	143.54±16.48	63-247
Time taken to adopt mating stance by male (sec)	13.00±2.71	5-40
Time taken in intromission (sec)	70.54±18.24	11-238
Mating duration (min)	11.49±0.76	5.20-15.06
Copulation duration (min)	10.23±0.68	4.58-14.50
No. of pelvic thrusts	86±5.58	38-114

§ A total of 13 matings were recorded

might be due to fact that in unmated females, the follicular phase is not terminated by ovulation at predetermined time. Similarly, alpaca females are usually receptive to mating regardless of stage of follicular development (Sumar *et al*, 1993) and refusal of a male by a female does not necessarily indicate absence of a mature follicle (Bravo *et al*, 1994).

Coming closer to the male, approached by the male and restlessness were the most frequently observed behaviours in the females selected by the male for mating. However, as all these signs seem to be very variable in duration and intensity that they are unreliable for the detection of receptivity. Swelling of vulva and vaginal mucous discharge could not be observed in female camels even at the time of maximum receptivity. Contrary to this, swelling of vulva in female dromedary during estrous has been reported by other investigators (Yasin and Wahid, 1957; Novoa, 1970; Wilson, 1984). In other camelid species llama, oedema or enlargement of the vulvar lips was discrete and seen only in maiden females and changes in the external genitalia and vaginal cytology are not good indicators of sexual receptivity or ovarian status. (Leon *et al*, 1992; Ferrer *et al*, 1999). Frequent micturition, observed as a consistent sign of sexual receptivity by Joshi *et al* (1978) could not be observed in the present study. Interestingly, in most of the matings (84.62%) female camels selected by the male kept the tail off the genitalia just after mounting of the male to allow intromission. However, in the mating of females randomly selected by herdsmen in the institute farm that were not a part of study, it was observed that females did not express this behaviour and animal handler had to remove the tail off the genitalia forcefully. The continuous grunting by female camels during mating behaviour reported as a constant feature of mating in previous studies (Joshi, 1972) and also observed by authors in the majority of matings of randomly selected females in the farm, which was not observed in the females selected by

the male, except 2 matings in the females mated a few days back and had corpus luteum on ovaries.

Although male selected the females irrespective of the sexual behaviour, the selected females had follicles of diameter ≥ 0.9 cm (0.9-2.3 cm) that ovulated in response to mating (Mahla, 2013), suggesting that the reproductive efficiency in camel can be increased by adopting natural breeding system in which male camel selects female for mating.

In conclusion, signs of sexual behaviour were unreliable in determining the timing of breeding or insemination as camels did not exhibit distinct periods of overt oestrus or sexual receptivity.

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