

Estrus Behaviour and Estrus Intensity Score in Relation to Hormonal Profile in Kankrej Cows at an Organized Farm

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ABSTRACT

The present investigation was undertaken to study the estrus behaviour in Kankrej cattle at an organized farm during 3 different seasons. In each of three seasons, seven (07) Kankrej heifers and seven (07) Kankrej cows showing estrus were considered. In Kankrej cattle, majority of the animals showed acceptance of teaser bull (100%), estrual mucus discharge (88.10%), homosexuality (78.57%), excitement, and edema erythema and wetness of vulva (76.19% each), frequent micturition (59.52%) and bellowing (16.67%). None of the Kankrej cattle went partial or complete off-feed during estrus phase. Overall it was revealed that the estrus signs were manifested more during summer season than monsoon and winter, which shows the heat tolerance capability of the Kankrej cows in the area. Nearly three fourth (73.81%) of the total Kankrej cows exhibited normal and above normal estrus intensity score, whereas one fourth (26.19%) animals showed weak estrus intensity score. The difference between Kankrej cows and heifers for overall intensity score was found non-significant ($p > 0.05$). The serum estradiol concentrations in Kankrej heifers and cows were significantly higher on the day of estrus than the corresponding levels on 11th day of estrus with inverse trend of serum progesterone in all three seasons. On the day of estrus the mean estradiol level in Kankrej heifers and progesterone levels in cows were higher in summer than winter and monsoon.

Key words: Estrus behaviour, Hormone, Intensity of estrus, Kankrej cattle.

Ind J Vet Sci and Biotech (2023): 10.48165/ijvsbt.19.1.14

INTRODUCTION

The domestic cattle (*Bos indicus*) in the country are one of the major contributors (35.93 %) in the livestock population (20th Livestock census; Anonymous, 2020) with an average daily milk yield of 2.54 kg. India is the prime possessor of about 202 livestock breeds inclusive of 50 cattle breeds, and Gujarat is having four breeds of cattle including Gir, Kankrej, Dangi and Dagri. Kankrej is good milk producer and bullocks are very powerful, suitable for draft and well known for their "Sawai Chall." The breed comes from the southeast of desert of Kutchh in western India, particularly along the banks of the rivers Banas and Saraswati, which flow from the east to west and drain into the desert of Kutchh. Other synonyms of Kankrej are Bannai, Talabda, Vadhiyar, Wadhir, and Banas Kankrej.

Reproductive management is one of the important pillars of livestock production. Reproduction management directly affects the calving-to-conception interval, thus affecting the calving interval and milk production (Lopez *et al.*, 2004; Lopez-Gatius *et al.*, 2005; Butani *et al.*, 2008). The variation in the expression of the estrus symptoms is directly proportional to the endocrine constitution of the animal. However, correct estrus detection is still one of the obstacles to obtain high pregnancy rates and is, many times, cited as the most common and expensive flow in Artificial Insemination programs. Factors such as frequency, length, observation time and number of cows simultaneously in estrus (Lamothe *et al.*, 1995) may influence the efficiency

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How to cite this article: Madhavatar, M. P., Ankuya, K. J., Pawar, M. M., Patel, M. P., Srivastava, A. K., & Modi, R. J. (2023). Estrus Behaviour and Estrus Intensity Score in Relation to Hormonal Profile in Kankrej Cows at an Organized Farm. *Ind J Vet Sci and Biotech*. 19(1), 61-65.

Source of support: Nil

Conflict of interest: None

Submitted: 28/10/2022 **Accepted:** 02/12/2022 **Published:** 10/01/2023

of estrus detection programs. The information on estrus behaviour and estrus intensity score in relation to hormonal profile in indigenous cattle is scarce, and hence was studied in Kankrej cows and heifers.

MATERIALS AND METHODS

The present study was conducted on Kankrej cattle maintained at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Banaskantha (Gujarat). In all 21 Kankrej heifers and 21 Kankrej cows showing estrus and devoid of any obvious

clinical disease or abnormalities were selected for the whole experiment during the year, irrespective of their lactation. The year was divided into 3 seasons, viz., summer (March to June), monsoon (July to October) and winter (November to February). The heifers and cows were different at different season. A group of 7 heifers and 7 cows was observed for estrus behavior in each season.

Sexual behavioural activities of Kankrej animals were observed visually and signs like bellowing, homosexuality, excitement, teaser bull acceptance, frequent micturition, off feed, estrual mucus discharge, and edema, erythema and wetness of vulva *etc.* were noted. Intensity of heat was scored in a scale of 0 to 20 for different signs of estrus and the animals were graded into three categories on the basis of the points scored by them as per Rao and Rao (1981) as: Weak heat: < 7 points; Normal heat: 8 to 14 points, and Intense heat: > 14 points.

The intensity of heat was recorded when the bull was parading on the herd on the day of estrus for 30 min in each session. Besides this, the estrus female was exposed to teaser bull for 20 to 30 min three times a day, *i.e.*, 8:00 AM, 1:00 PM and 6:00 PM to observe the acceptance of bull. Female was considered to be out of estrus when the bull failed to detect heat, stopped mounting and didn't exhibit Flehmen reaction.

To estimate the serum hormone profile, 5 mL blood sample was collected by puncturing the jugular vein on the day of estrus (at the time of AI) and 11th day post-AI from the individual animal. Serum was separated out within 1 h of collection by centrifugation at 700 x g for 15 min and was stored at -20 °C in deep freeze until analyzed for estradiol (E₂) and progesterone (P₄) concentration by standard Enzyme Linked Immunosorbent Assay (ELISA) technique using standard diagnostic kit. The data were analyzed using descriptive statistics, ANOVA and Duncan's new multiple range test (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

The number and percentage of estrus observations that Kankrej cattle (cows + heifers) exhibited in different seasons are presented in Table 1. Majority of the animals showed acceptance of teaser bull (100.00%), followed by estrual mucus discharge (88.10%), homosexuality (78.57%), excitement (76.19%), edema erythema and wetness of vulva (76.19%), frequent micturition (59.52%), and bellowing (16.67%). None of the Kankrej cows showed partial or complete off feed during estrus, hence there was no drop in milk production. This was in accordance with the findings of Füllner and Scholz (2014) in dairy cows of Germany.

Bellowing was less pronounced in Kankrej cattle with only 16.67 % animals bellowed during estrus. However, 42.86 % bellowing was observed during summer season which might be due to higher level of estrogen in this season. This finding was in accordance with Gunasekaran *et al.* (2008) in crossbred cattle (19.85%) and Layek (2010) in Sahiwal cows (18.96%).

However, the results were lower than the investigations of Mangal (2009) in Sahiwal cows (21.81%) and Ansari (2011) in Deoni cattle (80.00%). Mounting behaviour was recorded in 78.57 % estrus observations, and it was more pronounced in summer and monsoon season, whereas lower in winter season. Looking to the results, it can be advocated that the Kankrej cattle should be taken care off during winter season for heat detection. Our result was similar to that found by Mangal (2009) in Sahiwal (74.54%), however, it was higher than 40.44% found by Gunasekaran *et al.* (2008) in crossbred cattle, and lower than 90-96% reported by Layek (2010) in Sahiwal cows and Ansari (2011) in Deoni cattle.

Majority of the animals in estrus were continuously moving from one place to another, walking along the fences and at most times isolated themselves. Excitement was noticed in 76.19 % animals, while homosexual behaviour was more pronounced in summer (100%) and monsoon (100%) season, whereas lower in winter season (28.57%). These observations concurred with the reports of Mangal (2009) and Ansari (2011) in zebu cows (76.36%). However, Layek (2010) in Sahiwal cows (68.96%) and Gunasekaran *et al.* (2008) in crossbred cattle (45.59%) reported lower incidence of excitement than the present findings.

In Kankrej cattle, 100 % animals in estrus showed acceptance to mounting by teaser bull, which compared well with observations of Layek (2010) in Sahiwal cows (98%), whereas Gunasekaran *et al.* (2008) in crossbred cattle (45.59%), Mangal (2009) in Sahiwal cows (80%) and Ansari (2011) in Deoni cattle (74%) recorded lower incidence of the same.

More than fifty per cent animals (59.52%) exhibited frequent micturition. This was quite higher than 10.00 to 17.24% reported by Mangal (2009) and Layek (2010) in Sahiwal cows, Gunasekaran *et al.* (2008) in crossbreds, and Ansari (2011) in Deoni cattle. In the present study frequent micturition was more pronounced in summer (64.29%) than monsoon (57.14%) and winter (57.14%). Furthermore, 88.10% of Kankrej cattle exhibited mucus discharge, which concurred with observations of Mangal (2009) in Sahiwal cows (85.45%). However, it was little lower than 99.20% observed in crossbred cattle by Gunasekaran *et al.* (2008) and 96.00% in Deoni cattle by Ansari (2011). In the present investigation 100 % animals showed mucus discharge in summer and monsoon season, whereas, 64.29 % animals showed mucus discharge in winter season (Table 1).

Edema erythema and wetness of vulva is observed in the peri-estrus period. In present study, more than three fourth (76.19%; 32/42) of the Kankrej cattle showed edema, erythema and wetness of vulva, which concurred well with Mangal (2009) in Sahiwal cows (74.54%). Season-wise analysis revealed that 100 % animals showed edema erythema and wetness of vulva in summer and monsoon season, whereas only 28.57 % animals showed this in winter season. This might be related to circulatory levels of estrogen. Gunasekaran *et al.* (2008) in Karan Fries and Karan Swiss crossbred cattle (100%), Layek (2010) in Sahiwal cows (100.00%) and Ansari



Table 1: Season-wise observations of estrus symptoms in Kankrej cattle (heifers + cows)

Character/Season	Summer (n=14)	Monsoon (n=14)	Winter (n=14)
Bellowing	06 (42.86)	00 (0.00)	01 (7.14)
Homosexuality	14 (100.00)	12 (85.72)	07 (50.00)
Excitement	14 (100.00)	14 (100.00)	04 (28.57)
Teaser bull acceptance	14 (100.00)	14 (100.00)	14 (100.00)
Frequent micturition	09 (64.29)	08 (57.14)	08 (57.14)
Off feed	00 (0.00)	00 (0.00)	00 (0.00)
Estrual mucus discharge	14 (100.00)	14 (100.00)	09 (64.29)
Edema, erythema and wetness of vulva	14 (100.00)	14 (100.00)	04 (28.57)

Figures in parentheses indicate percentages of Kankrej cattle (heifers + cows)

Table 2: Season-wise frequency distribution of estrus intensity in Kankrej cattle (n = 42)

Season	n	Estrus intensity score		
		Weak (0-7)	Normal (8-14)	Intense (> 14)
Summer	14	00 (0.00)	06 (42.90)	08 (57.10)
Monsoon	14	03 (21.43)	11 (78.57)	00 (0.00)
Winter	14	08 (57.14)	06 (42.86)	00 (0.00)
Overall	42	11 (26.19)	23 (54.76)	08 (19.05)

Figures in parentheses indicate percentages of Kankrej cattle (heifers + cows).

(2011) in Deoni cattle (96.00 %) recorded somewhat higher frequency of this sign.

In the present study, 57.10, 42.90 and 0.00 % of Kankrej cattle (cows + heifers) during summer exhibited intense, normal and weak signs of estrus, whereas in monsoon 0.00, 78.57 and 21.43 %, and in winter season 0.00, 42.86 and 57.14 % showed intense, normal and weak signs of estrus, respectively (Table 2). Overall pooled data clearly indicated that nearly three forth (73.81%) of Kankrej cattle showed normal and intense estrus and rest of them (26.19 %) showed weak estrus. In particular looking to the breeding tract of the Kankrej cattle where environmental temperature ranges between 40 to 45 °C in summer season, 100 % animals (cows and heifers) show normal and above estrus intensity score. This shows heat tolerance ability of Kankrej cattle in tropical region where tropic of cancer is passing through.

The results obtained for intensity of estrus are in accordance with the findings of Singh and Kharche (1985) in HF×TP cross and Naidu and Rao (2006) in Ongole cows, whereas it contradicted the findings of Gunasekaran *et al.* (2008) in crossbred, Layek (2010) in Sahiwal and Ansari (2011) in Deoni cattle. This might be due to different geographical location, different breeds and their ability to resist against heat stress.

Further, the results depicted in the Table 3 indicate that during summer season the concentrations of serum estradiol in Kankrej heifers and cows were significantly higher on the day of estrus than the levels on 11th day of estrus (58.21±4.61 vs. 38.82±4.38 pg/mL, 56.03±5.05 vs 32.66±4.43 pg/mL respectively), and similar were the observations during

monsoon and winter seasons also. Overall, the mean level of estrogen in Kankrej heifers on the day of estrus was higher in summer than winter and monsoon. These findings concurred with Noseir (2003). These results were also in agreement with findings of Roy and Prakash (2009), who revealed that the peak levels of E₂ (20.20 ± 2.87 ng/mL) occurred during the peri-estrus period and decreased thereafter in Murrah buffalo heifers. The peak concentration of E₂ during estrus period following luteolysis is the important factor contributing the behavioural manifestation of estrus in cows/buffaloes. Comparable findings at estrus were reported by Dhali *et al.* (2005) in Mithun (*Bos frontalis*) (19.23 ± 2.14 pg/mL) and Naik *et al.* (2013) in Punganur cows (20.24 pg/mL) with reduced level on 11th day post-estrus (12.36 pg/ mL).

The overall and seasonal average progesterone levels in Kankrej heifers and cows on the day of estrus were significantly lower than the respective levels on the 11th day post-estrus (Table 3). Further the mean progesterone concentration was higher in monsoon season followed by summer and lower in winter season. However, there was non-significant difference between seasons at 11th day post-estrus. These results were in accordance with the findings and suggestion of Hafez *et al.* (2008) that in the initial phase of estrus progesterone level remains < 0.5 ng/mL and at the luteal phase progesterone level goes beyond > 1 ng/ mL due to the development of CL. The progesterone levels on the day of estrus found here closely resembled those reported by Diaz *et al.* (1986) in Holstein, Brahman, Carora type and crossbred cows (0.5 ng/mL), and Dutta *et al.* (1990) in crossbreds cows (0.30±0.13 ng/ mL).

Table 3: Mean (\pm SE) concentration of estradiol and progesterone in different groups of Kankrej heifers and cows (n=21 each) at various periods/seasons

Hormone	Season	Heifers		Cows	
		On the day of estrus	11 th day post-estrus	On the day of estrus	11 th day post-estrus
Serum estradiol (pg/ mL)	Summer (n=7)	58.21 \pm 4.61 ^{aA}	38.82 \pm 4.38 ^{bB}	56.03 \pm 5.05 ^{aA}	32.66 \pm 4.43 ^{bB}
	Monsoon (n=7)	52.40 \pm 3.76 ^{aC}	43.49 \pm 3.58 ^{bA}	39.07 \pm 5.98 ^C	30.67 \pm 5.24 ^C
	Winter (n=7)	53.28 \pm 4.61 ^{aB}	36.37 \pm 4.38 ^{bC}	50.72 \pm 4.23 ^{bB}	36.94 \pm 3.70 ^{aA}
	Overall (n=21)	54.31\pm2.40	40.12\pm2.32	49.76\pm3.03	34.15\pm2.44
Serum progesterone (ng/mL)	Summer (n=7)	0.52 \pm 0.76 ^{aA}	5.24 \pm 0.73 ^{abB}	0.62 \pm 1.72 ^{aA}	5.07 \pm 0.71 ^{aA}
	Monsoon (n=7)	0.42 \pm 0.76 ^{aA}	5.86 \pm 0.60 ^{aB}	0.34 \pm 2.03 ^{aC}	4.29 \pm 0.84 ^{bB}
	Winter (n=7)	0.36 \pm 0.62 ^{aA}	3.43 \pm 0.73 ^{bB}	0.59 \pm 1.44 ^{aB}	4.25 \pm 0.59 ^{bC}
	Overall (n=21)	0.43\pm0.04	4.99\pm0.43	0.52\pm0.08	4.52\pm0.39

Means bearing superscripts (a, b) differ significantly within the row and those bearing superscripts (A, B, C) differ significantly within the column ($p < 0.05$) for a particular hormone.

CONCLUSIONS

The findings of the study revealed that Kankrej heifers and cows manifest majority of estrus signs in all seasons. However, the percentages of animals showing estrus signs were higher in summer season than monsoon and winter. All Kankrej cows in all three seasons showed teaser bull acceptance and lower number of animals showed signs of bellowing. Nearly three fourth of the total Kankrej cows exhibited estrus intensity score normal and above normal, and the rests showed weak estrus intensity score without difference for parity. There were significant differences between day of estrus and 11th day post-estrus for both estrogen and progesterone levels in all seasons, and non-significant differences between seasons only for estrogen levels at both the periods.

ACKNOWLEDGEMENT

The authors are highly thankful to Dean, College of Veterinary Science and A.H. and Director of Research, S.D. Agricultural University, Sardarkrushinagar, Dantiwada for providing financial assistance and research facilities.

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