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Research Article

CALVING PATTERN IN GIR CATTLE: A COMPARATIVE STUDY BETWEEN PRIMIPAROUS AND PLURIPAROUS COWS

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ABSTRACT

The present study was planned to understand the factors affecting the calving pattern in primiparous and pluriparous Gir cows. A cumulative seven years (2013-2019) full term calving record (n = 1006) of Gir cows were incorporated. There was significant effect of calving month on the frequencyof calving in primi- and pluriparous Gir cows ($\chi 2 = 21.519$, df = 11, p = 0.028). Season had non-significant effect on calving pattern in primi- and pluriparous Gir cows ($\chi 2 = 2.834$, df = 2, p = 0.242). Period significantly affected the calving pattern in primi- and pluriparous Gir cows ($\chi 2 = 47.424$, df = 6, $p < 0.001$). The calving pattern in primi-and pluriparous cows was similar with reference to time of birth and calf sex. Moreover, significantly 22.06% more calving occurred during day time as compared to night time ($\chi 2 = 49.877$, df = 1, $p < 0.001$). The overall seasonality of calving index was 38.61%. However, parity wise data reflected higher value of seasonality index in both primiparous (51.43%) and pluriparous (53.16%) cows as compared to overall seasonality index value. The results showed that Gir cows calved uniformly throughout the year.

Keywords: Calving pattern, Gir cows, Primiparous, Pluriparous, Seasonality of calving index

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The Gir cattle is one of the most abundant dairy type breed of Saurashtra region of Gujarat. They are well-known for their docile and cooperative temperament producing total and 300 days lactation yield of 1755-2810 liters and 1637-2309 liters milk per lactation, respectively (Patbandha *et al.*, 2020). The productivity of this breed remains similar throughout the year across different seasons (6.1-6.4 and 5.8-6.3 litter/day during summer and winter, respectively; Patbandha *et al.*, 2020). This breed thrives well and maintains sustainable production under extreme weather conditions and sub-optimal nutrition (Gajbhiye *et al.*, 2016; Patbandha *et al.*, 2020). Various climatic factors like temperature, relative humidity, day length and photoperiod influence the reproductive performance of dairy bovines (Singh *et al.*, 2013) and affecting the market availability of raw milk. Continuous supply of raw milk is prerequisite at consumer level, but dairy species do not meet such demands as they have tendency of calving more in one than in other season (Hassan *et al.*, 2007). There are few reports on seasonality of calving in indigenous cattle of India, but such information is scanty in Gir cows. Hence, understanding the calving pattern of the Gir cattle in a particular agro-climatic zone is a pre-requisite to design strategies for the continuous supply of raw milk throughout the year. The objective of the present study was to document the calving pattern of Gir cows with special reference to their parity in the South Saurashtra Agro-climatic region of Gujarat.

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MATERIALS AND METHODS

The current experiment was conducted on a pure herd of Gir cattle maintained at Cattle Breeding Farm, Junagadh (Gujarat), India. It is the largest and oldest organized farm established in the year 1920 and has been maintaining purebred herds of Gir cows and Jaffrabadi buffaloes for conservation and improvement, since its inception. It is located at 70.5° east longitude and 21.4° north latitude and is about 60 meters above mean sea level. The climate of this region is mainly tropical to sub-tropical. The cows were maintained under loose housing system of management with pucca floor. The animals were fed measured quantity of seasonal green fodder (maize, jowar and lucerne) and *ad-lib*. dry fodder. Chopped green fodder was distributed twice a day (11-12 hours during morning and 16-17 hours during afternoon). In pregnant animals, green fodders were also offered at night time. The animals were hand milked twice daily in the milking parlour where they were offered concentrate mixture and calves were allowed for milk let down. All the managerial practices were similar throughout the year. Data included natural full term calving (n=1006) spreaded over a period of 7 years, from 2013 to 2019. Keeping in view the climatological data (Table 1), the year was divided into three seasons: winter (November to February), summer (March to June) and rainy (July to October). The frequency of calving pattern between primi- and pluriparous cows were calculated and expressed as percent for better interpretation. Effect of certain factors like month and season of birth, period of calving, diurnal caving (day and

night) and calf sex on parity (primi- and pluriparous) were calculated using SPSS software by chi-square test. The day-night effect on overall calving pattern was also evaluated using chi-square test. The effect was considered as significant if 'p' ≤ 0.05. Seasonality of calving index was calculated as per the standard formula [1- (Number of calvings in the month with the fewest calvings/Number of calvings in the month with the most calvings)] given by Oseni *et al.* (2003). The index value was expressed as percent for better interpretation.

RESULTS AND DISCUSSION

There was significant variation of calving pattern among different months in primi- and pluriparous Gir cows ($\chi 2 = 21.519$, df = 11, p = 0.028; Table 2). However, season had no effect on calving pattern in primi- and pluriparous Gir cows ($\chi 2 = 2.834$, df = 2, p = 0.242; Table 3). Period also significantly affected the calving pattern in primi- and pluriparous Gir cows ($\chi 2 = 47.424$, df = 6, p < 0.001; Table 4). Time of birth (day - night) and sex of calf did not affect the calving pattern in primiparous and pluriparous Gir cows. (Table 5 and Table 6, respectively). Moreover, significantly 22.06% more number of birth occurred during day time as compared to night time ($\chi 2 = 49.877$, df = 1, p < 0.001).

Highest calving frequency was recorded in July and August (11.29%) for the primiparous Gir cows, whereas, in January (11.35%) for the pluriparous Gir cows (Table 2). The overall calving pattern showed that Gir had highest calvings in January (10.04%) and lowest calvings (6.16%) in February (Table 2). Contrary to the present study, Hassan et al. (2007) and Khan *et al.* (1997) reported higher calving frequency during the months January-February-March in Sahiwal cows. Moreover, there were higher calving incidence during August (14.6%) and September (15.2%) as compared to other months in crossbred dairy cows (Hassan *et al.*, 2007).The variation of calving frequency throughout the year might be attributed to the occurrence of estrus followed by conception in dairy cattle. It has been observed that the occurrence of estrus is more in indigenous Tharparkar cattle during summer but in crossbred Vrindavani cattle during winter season (Chaudhari *et al.*, 2015). Further, the conception rate also influenced markedly owing to seasonal variation in dairy cattle. Abdullah *et al.* (2017) observed higher conception rate during winter and lower during hot-humid season in crossbred cattle. The conception rate varies from 27.7 (summer season) to 42.6% (winter season) across different seasons in dairy cattle of Israel (Wolfenson and Roth, 2019).

Maximum number of calving in primi and pluriparous cows occurred during rainy season (34.89%) followed by the winter (32.70%) and summer season (32.41%), respectively although it was statistically non-significant (Table 3). The result of the present study indicated that the calving in Gir cows occurred throughout the year. However, Hassan *et al.* (2007) observed higher number of calving during winter and autumn in Sahiwal and crossbred cows, respectively. Chaudhary *et al.* (2015) reported maximum calving during summer in Tharparkar cattle (41.84%), but in Vrindavani cattle it was winter (41.70%). Maximum percent calving occurred in winter season for crossbred cattle as reported by Hashmi *et al.* (2007). The variation might be due to variation of occurrence of estrus and conception. However, the present study revealed that season had no effect on calving pattern

Table 1

Mean monthly weather data during 2013-2019

Months	Temperature (ºC)	Relative Humidity (%)	Rainfall (mm)	Wind speed (km/hour)	Sunshine (hour)
January	20.81±0.30	49.39±2.12	0.00±0.00	4.26±0.32	7.9±0.26
February	23.83±0.28	47.13±1.99	0.01±0.01	4.59±0.17	8.4±0.29
March	27.76±0.41	43.60±2.56	0.14±0.11	5.40±0.08	9.5±0.16
April	30.93±0.30	48.31±0.86	0.03±0.03	6.38±0.26	9.7±0.19
May	32.85±0.21	56.62±1.22	0.00±0.00	8.68±0.31	9.6±0.37
June	31.47±0.30	69.41±1.34	6.45±2.17	9.89±0.64	3.8±0.52
July	28.59±0.36	83.17±1.56	11.34±1.69	8.75±0.50	0.9±0.33
August	27.75±0.19	84.49±1.49	7.40±1.74	6.40±0.69	1.3±0.28
September	28.09±0.19	77.60±2.16	9.31±2.72	3.95±0.37	5.1±0.55
October	28.83±0.39	59.74±3.07	1.42±0.70	2.56±0.29	8.1±0.36
November	25.85±0.39	52.75±2.24	0.22±0.16	2.74±0.25	8.1±0.34
December	21.97±0.25	50.91±1.27	0.01±0.01	3.72±0.23	7.2±0.58

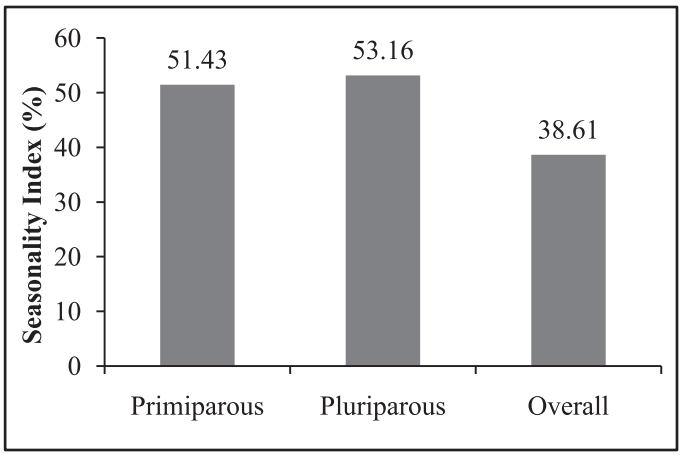

Fig. 1. Seasonality of Calving Index in Gir cows

Table 2

Month wise percent calvings of primiparous and pluriparous Gir cows

Months	Primiparous (%)	Pluriparous (%)	Overall (%)
January	22 (7.10)	79 (11.35)	101 (10.04)
February	25 (8.06)	37 (5.32)	62 (6.16)
March	27 (8.71)	53 (7.61)	80 (7.95)
April	22 (7.10)	52 (7.47)	74 (7.36)
May	28 (9.03)	64 (9.20)	92 (9.15)
June	24 (7.74)	56 (8.05)	80 (7.95)
July	35 (11.29)	37 (5.32)	72 (7.16)
August	35 (11.29)	64 (9.20)	99 (9.84)
September	23 (7.42)	62 (8.91)	85 (8.45)
October	25 (8.06)	70 (10.06)	95 (9.44)
November	17 (5.48)	50 (7.18)	67 (6.66)
December	27 (8.71)	72 (10.34)	99 (9.84)
Total	310 (100%)	696 (100%)	1006 (100%)

$\chi 2 = 21.519$, df = 11, p = 0.028

Table 3

Seasonal incidences of primiparous and pluriparous Gir cows

Season	Primiparous (%)	Pluriparous (%)	Overall (%)
Winter (Nov-Feb)	91 (29.35)	238 (34.20)	329 (32.70)
Summer (Mar-Jun)	101 (32.58)	225 (32.33)	326 (32.41)
Rainy (Jul-Oct)	118 (38.06)	233 (33.48)	351 (34.89)
Total	310 (100%)	696 (100%)	1006 (100%)

$\chi 2 = 2.834$, df = 2, p = 0.242

in primi- and pluriparous Gir cows as well as overall calving pattern.

There was significant effect of period (p<0.001) on calving pattern and the calving percent ranged from 10.00 to 20.97% in primiparous cows but from 10.20 to 17.24%

Table 4

Year wise percent calvings of primiparous and pluriparous Gir cows

Year	Primiparous (%)	Pluriparous (%)	Overall (%)
2013	34 (10.97)	72 (10.34)	106 (10.54)
2014	62 (20.00)	115 (16.52)	177 (17.59)
2015	17 (5.48)	119 (17.20)	136 (13.52)
2016	65 (20.97)	115 (16.52)	180 (17.89)
2017	37 (11.94)	120 (17.24)	157 (15.61)
2018	31 (10.00)	84 (12.07)	115 (11.43)
2019	64 (20.65)	71 (10.20)	135 (13.42)
Total	310 (100%)	696 (100%)	1006 (100%)

$\chi 2 = 47.424$, df = 6, p < 0.001

Table 5

Diurnal calving pattern in primiparous and pluriparous Gir cows

Calving time	Primiparous (%)	Pluriparous (%)	Overall (%)
Day time (6a-6p)	185 (59.68)	429 (61.64)	614 (61.03)
Night time (6p-6a)	125 (40.32)	267 (38.36)	392 (38.97)
Total	310 (100%)	696 (100%)	1006 (100%)

$\chi 2 = 0.346$, df=1, p=0.556

Table 6

Effect of calf sex on calving pattern of primiparous and pluriparous Gir cows

Calf sex	Primiparous (%)	Pluriparous (%)	Overall (%)
Male	147 (47.42)	362 (52.01)	509 (50.60)
Female	163 (52.58)	334 (47.99)	497 (49.40)
Total	310 (100%)	696 (100%)	1006 (100%)

$\chi 2 = 1.809$, df = 1, p = 0.178

in pluriparous cows. The time of birth (day-night) and sex of calf did not affect the calving pattern in primi- and pluriparous cows. Moreover, significantly (p<0.001) 22.06% more number of birth occurred during day time as compared to night time which is in consonance with other studies conducted on Holstein cows (Pennington and Albright, 1985; Gleeson *et al.*, 2007) and beef cows (Jaeger *et al.*, 2008). On the other hand, Edwards (1979) reported uniform distribution of parturition in Holstein cows. The variation of results in different studies might be attributed to breed, parity or feeding management (Edwards, 1979; Pennington and Albright, 1985; Gleeson *et al.*, 2007; Jaeger *et al.*, 2008). Night feeding increases chances of delivery during day time (Pennington and

Albright, 1985; Gleeson *et al.*, 2007; Jaeger *et al.*, 2008); this is desired in a dairy farm because of labour constraints. In the current study, there was provision of feed during night time in advanced pregnant Gir cows, which might be the reason of higher birth during day time as compared to night time.

The overall seasonality of calving index was 38.61%, but the value was higher in primiparous (51.43%) and pluriparous (53.16%) Gir cows (Fig. 1). The seasonality of calving index reflected that the primiparous and pluriparous cows were more seasonal in calving when the calving records were analyzed parity wise. But in the Gir herd, the calving was less seasonal as indicated by overall seasonality of calving index (38.61%). However, Patel *et al.* (2017) reported 63% seasonality index in Kankrej cows in Gujarat (India). Similarly, higher seasonality index value for Sahiwal (60.3%) and crossbred (76.6%) cattle was observed by Hassan *et al.* (2007) in Pakistan. Moreover, in buffaloes, the value was higher i.e. 86% in Nili- Ravi (Hassan *et al.*, 2007) and 95% in Mehsana buffaloes (Patel *et al.*, 2017). Previous study by Hassan *et al.* (2007) cited significant parity effect on seasonality of calving index in Sahiwal (82.2 % vs. 52.8% for primi and pluriparous) and crossbred cattle (86.4% vs. 59.1% for primi and pluriparous). Such effect was not observed in Gir cows. Patel and Jethva (2015) reported seasonality index of 85.3, 28.6 and 25.5% in buffaloes, indigenous and crossbred cattle, respectively in Gujarat, India which is supported by the current study.

CONCLUSION

Results of the present study indicated that season, time of birth and sex of calf had no effect but the calving month and period had significant effect on calving pattern in primi- and pluriparous Gir cows. Moreover, significantly 22.06% more number of birth occurred during day time as compared to night time. The overall seasonality of calving index was 38.61%. However, parity wise data reflected higher value of seasonality index in both primiparous (51.43%) and pluriparous (53.16%) cows as compared to overall seasonality index value. This reflected that Gir cows calved uniformly across the year.

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