

# Factors Affecting Gestation Length in Gir Cattle

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## ABSTRACT

The present study was planned to understand the factors affecting gestation length in nulliparous and pluriparous Gir cows. A cumulative ten years (2010-2019) full term calving record (n = 1272) of Gir cows were incorporated. The overall mean gestation length of Gir cattle was 283.29 ± 0.16 days. It was shortest in 8<sup>th</sup> and above parities and longest in 7<sup>th</sup> parity Gir cows (282.39 and 285.84 days, respectively); with statistically significant (p<0.05) difference. The gestation length remained almost similar from nulliparous to 6<sup>th</sup> parities cows (ranged from 283.10 to 283.74 days) and the values were more or less close to the overall mean of gestation length. The mean gestation length in cows having female calf was 1.4 days shorter than those with male calf (282.60 vs. 283.99 days). There was period wise significant variation of gestation length in Gir cows (p<0.05). The Gir cattle served during December and March had shortest and longest mean gestation length (282.22 and 284.40 days), respectively; the difference was statistically significant (p<0.05). The mean gestation length across different calving months varied significantly (p<0.05). Season of service and season of birth did not affect gestation length in Gir cattle. The results showed that Gir cows are less affected for gestation length by different factors throughout the year.

**Key words:** Gestation length, Gir cattle, Month of service, Parity, Period, Sex of calf.

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## INTRODUCTION

In cow-calf operations, gestation length (GL) is one of the important traits to judge the cow efficiency (Gunawan *et al.*, 2013). Gestation length is defined as the time interval from successful conception until the calving (Norman *et al.*, 2007). It is an important fertility trait that affects both production as well as reproduction in farm animals. Effects of genetic and non-genetic parameters on gestation length were described by the earlier researchers (Messine *et al.*, 2007; Petrovic *et al.*, 2010; Gunawan *et al.*, 2013) in different cattle breeds (Gudali zebu, Simmental, Bali cattle). Previous scientists have described effects of various factors on GL, viz., calf sex and calving season seem to have a significant effect on GL (Al-Samarai, 2008; Talukder and Panandam, 2008; Kumar *et al.*, 2016). Cows with male calves had longer GL as compared to cows with female calves (Hansen *et al.*, 2004; Al-Samarai, 2008; Talukder and Panandam, 2008; Nogalski and Piwczynski, 2012; Dhakal *et al.*, 2013; Kumar *et al.*, 2016; Potdar *et al.*, 2017). High temperature in summer season shortens GL (McClintock *et al.*, 2003). The GL is found shorter in nulliparous than in pluriparous aged cows (Przysucha and Grodzki, 2009).

In India, only few reports pertaining to effects of various factors on GL in indigenous cattle are available, although, such information is scanty in Gir cows. According to Patbandha *et al.* (2020), this breed has total and 300-days lactation yield of 1755-2810 liters and 1637-2309 liters milk, respectively. Owing to the significant effects of various parameters on

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GL of different breeds, the present study was proposed to document their effects on GL in Gir cows.

## MATERIALS AND METHODS

### Data Collection and Study Area

The data (n=1272) used in the present study were collected from a pure herd of Gir cattle maintained at Cattle Breeding Farm, Junagadh (Gujarat), India during the period of 2010 to 2019. The climate of Junagadh is tropical to sub-tropical. The animals were managed under loose housing system with

pucca floor. The health monitoring protocol was followed as per the farm standards. The informations related to parity of dam, sex of calf, period or year of birth, month of service and birth were collected from the registers maintained at Cattle Breeding Farm, Junagadh. The GL was calculated from date of successful service and date of parturition.

### Data Classification and Statistical Analysis

For the present study, gestation length data were checked for normal distribution, and extreme values of mean  $\pm$  3SD were excluded before analysis. The data set was grouped into ten classes based on year or period of birth (i.e. 2010 to 2019), 8 classes based on parity of dam (Nulliparous, 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and  $\geq$ 8<sup>th</sup> parity), two classes based on sex of calves (female and male), 12 classes based on month of service or calving (January to December) and season of service or birth (Winter: Nov-Feb, Summer: Mar-Jun and Rainy: Jul-Oct). The data were analyzed by analysis of variance to estimate the effect of period, parity, sex, month and season on gestation length. The mean differences between groups were compared by 'Duncan' post-hoc test and the differences were considered significant when 'p' < 0.05.

## RESULTS AND DISCUSSION

### Mean Gestation Length:

The overall mean gestation length of Gir cattle was 283.29  $\pm$  0.16 days. Sobek *et al.* (2015) also reported similar GL in Simmental and Polish Red cattle (283.5 and 283.3 days, respectively), and lower gestation length in HF Black-White, HF Red-White, Jersey, Polish Red-White, Polish Black-White and Whitebacked cattle (279.9, 279.0, 280.3, 281.5, 280.5 and 281.1 days, respectively), whereas higher GL (i.e. 286.6 days) than the present finding was reported in Montbeliard cattle (Sobek *et al.*, 2015). Similarly, Potdar *et al.* (2017) observed lower mean GL in different breeds of dairy cattle (279.50  $\pm$  0.06 days in HF cross, 280.03  $\pm$  0.02 days in Jersey cross, 279.30  $\pm$  0.05 days in non-descriptive cattle and 279.32  $\pm$  0.24 days in Sahiwal cattle). Moreover, many earlier researchers (Al-Samarai, 2008; Norman *et al.*, 2009; Nogalski and Piwczynski, 2012; Dhakal *et al.*, 2013; Gunawan *et al.*, 2013; Bhutkar *et al.*, 2014; Kumar *et al.*, 2016) also observed the lower GL in purebred and crossbred dairy cattle. Talukder and Panandam (2008) reported the GL for Sahiwal-Friesian crossbred groups ranging between 279 and 283 days. Norman *et al.* (2009) reported higher GL in Guernsey (286 days) and Brown Swiss cows (288 days). Difference in gestation period might be attributed to genetic factor (Potdar *et al.*, 2017).

### Parity or Lactation No.

The mean gestation length of Gir cattle was minimum in 8<sup>th</sup> and above parities cows and maximum in 7<sup>th</sup> parity cows (282.39 and 285.84 days, respectively) (Table 1) and the difference was statistically significant (p<0.05). The results

revealed that the GL increased by 2.5 days in cows having parity 7<sup>th</sup> than the overall mean of GL. The mean gestation length remained almost similar from nulliparous to 6<sup>th</sup> parity cows (ranged from 283.10 to 283.74 days) and the values were more or less close to the overall mean of gestation length (Table 1). Similarly, Messine *et al.* (2007), Menon *et al.* (2014), and Potdar *et al.* (2017) also reported no difference in GL between nulliparous and multiparous cows. Contrary to the present findings, several researchers (McClintock *et al.*, 2003; Al-Samarai, 2008; Bakir and Cilek, 2009; Norman *et al.*, 2009; Petrovic *et al.*, 2010; Nogalski and Piwczynski, 2012; Dhakal *et al.*, 2013; Gunawan *et al.*, 2013; Kumar *et al.*, 2016) observed longer GL in multiparous crossbred cows than the primiparous cows and suggested that an increase in parity prolongs the GL because of the relatively large fetus. The body size of cow increases with increase in age and parity and results larger fetus, but after 10 years of age the animal becomes older and the fetus size reduced (Parikh *et al.*, 2022).

### Sex of Calf

The mean gestation length of Gir cows having female calf was 1.4 days shorter than those with male calves (282.60 vs. 283.99 days, Table 1). Our results are in consonance with previous report of Dhakal *et al.* (2013), who found GL 1.3 days longer for male calves as compared to female calves. According to, Hansen *et al.* (2004) and Al-Samarai (2008), GL was 1.1 days longer for male calves. Whereas, some other researchers observed GL of male calves was 0.5 to 1.8 days longer as compared to female calves (Nogalski and Piwczynski, 2012; Kumar *et al.*, 2016; Potdar *et al.*, 2017). Talukder and Panandam (2008) also reported that male calves weighed significantly heavier than female calves of Sahiwal-Friesian crossbred groups.

**Table 1:** Parity and sex of calf wise gestation length in Gir cows

Parameters	No. of Observation	Gestation Length (days)
<b>Overall</b>	1272	283.29 $\pm$ 0.16
<b>Parity</b>		
Nulliparous	398	283.10 <sup>a</sup> $\pm$ 0.27
1 <sup>st</sup>	316	283.11 <sup>a</sup> $\pm$ 0.33
2 <sup>nd</sup>	209	283.51 <sup>ab</sup> $\pm$ 0.41
3 <sup>rd</sup>	136	283.39 <sup>ab</sup> $\pm$ 0.54
4 <sup>th</sup>	86	283.74 <sup>ab</sup> $\pm$ 0.63
5 <sup>th</sup>	57	283.32 <sup>ab</sup> $\pm$ 0.79
6 <sup>th</sup>	28	283.54 <sup>ab</sup> $\pm$ 1.29
7 <sup>th</sup>	19	285.84 <sup>b</sup> $\pm$ 2.15
8 <sup>th</sup> & above	23	282.39 <sup>a</sup> $\pm$ 1.55
<b>Sex of Calf</b>		
Female	636	282.60 <sup>a</sup> $\pm$ 0.22
Male	636	283.99 <sup>b</sup> $\pm$ 0.24

Means bearing different superscripts within the column differ significantly at p<0.05 for a parameter



## Period

The result showed period wise significant variation in gestation length of Gir cows (Table 2). Similarly, Al-Samarai (2008) and Bhutkar *et al.* (2014) observed a significant effect of period on GL in crossbred cattle. Whereas, contrary to the present study, Turkyilmaz (2005) and Kumar *et al.* (2016) found no significant influence of period of calving on GL of Holstein cows calved in different years. The mean GL was shortest during 2011 (280.38 days) and longest during 2017 (284.85 days), which shows about 4.5 days variation. Moreover, the mean gestation lengths during 2010, 2016, 2018 and 2019 were close to the overall mean gestation length value i.e. 283.29 days. Kumar *et al.* (2016) observed a total linear change of 3.28 days variation over 39 years of study in Jersey crossbred cattle, but the difference was non-significant ( $p>0.05$ ). The increase in GL over the years in the present study is unexpected which might be attributed to natural selection or selection for correlated traits like milk production, milk composition etc. Further, selection causes reduction of premature birth in dairy cattle which subsequently may prolong GL (Silva *et al.*, 1992).

**Table 2:** Period of calving wise gestation length in Gir cows

Parameters	No. of Observation	Gestation Length (days)
<b>Period of Calving</b>		
2010	123	283.76 <sup>cd</sup> ±0.39
2011	105	280.38 <sup>a</sup> ±0.44
2012	115	281.49 <sup>ab</sup> ±0.55
2013	93	282.29 <sup>bc</sup> ±0.56
2014	150	284.01 <sup>d</sup> ±0.48
2015	131	284.40 <sup>d</sup> ±0.55
2016	173	283.17 <sup>cd</sup> ±0.48
2017	144	284.85 <sup>d</sup> ±0.52
2018	104	283.68 <sup>cd</sup> ±0.53
2019	134	283.67 <sup>cd</sup> ±0.58

Means bearing different superscripts within the column differ significantly between periods at  $P<0.05$ .

## Month and Season of Service

The Gir cattle served during December and March had lowest and highest mean GL (282.22 and 284.40 days), respectively (Table 3), the difference was statistically significant ( $p<0.05$ ). Further, next to March, the cattle inseminated in August month had 284.20 days GL, which was 1.98 days higher than those inseminated in December ( $p<0.05$ ). Season of service did not affect GL in Gir cattle. The present finding is in consonance with Norman *et al.* (2009) who reported that Brown Swiss, Holstein and Jersey cows inseminated during October month had shortest GL, whereas Brown Swiss cows inseminated during May month had longest GL, while Holstein and Jersey cows inseminated during January-February had longest GL.

**Table 3:** Month and season of service wise gestation length in Gir cows

Parameters	No. of Observation	Gestation Length (days)
<b>Month of Service</b>		
Jan	111	283.55 <sup>ab</sup> ± 0.53
Feb	101	283.70 <sup>ab</sup> ± 0.62
Mar	134	284.40 <sup>b</sup> ± 0.46
Apr	112	282.68 <sup>ab</sup> ± 0.60
May	107	282.60 <sup>ab</sup> ± 0.52
Jun	117	283.67 <sup>ab</sup> ± 0.54
Jul	114	282.77 <sup>ab</sup> ± 0.55
Aug	101	284.20 <sup>b</sup> ± 0.58
Sep	77	283.52 <sup>ab</sup> ± 0.66
Oct	85	283.35 <sup>ab</sup> ± 0.72
Nov	104	282.74 <sup>ab</sup> ± 0.54
Dec	109	282.22 <sup>a</sup> ± 0.62
<b>Season of Service</b>		
Winter (Nov-Feb)	425	283.05 ± 0.29
Summer (Mar-Jun)	470	283.40 ± 0.26
Rainy (Jul-Oct)	377	283.44 ± 0.31

Means bearing different superscripts within the column differ significantly at  $p<0.05$  for a parameter

## Month and Season of Calving

The mean GL across different calving months varied significantly (Table 4). The mean GL was shorter in cows those calved during September, while longer in May month (282.20 vs. 284.62 days) and there was 2.42 days variation. The mean GL of cattle delivered during June was about 2.0 days longer than those calved during September ( $p<0.05$ , Table 4). Present finding suggested that there is no effect of extreme weather or heat stress on GL during the summer season. Contrary to the present findings, earlier researchers (Hansen *et al.*, 2004; Przysucha and Grodzki, 2009; Nogalski and Piwczynski, 2012; Potdar *et al.*, 2017) noted the effect of higher temperature and dietary changes on shorter GL.

The influence of season of calving on GL was found non-significant in the present study. Contrary to this, Kumar *et al.* (2016) observed significant difference in GL of Jersey crossbred cows calved in summer and rainy season than those calved during the winter season. Al-Samarai (2008) also revealed significant effect of season and year of calving on GL in Holstein cows. In Gir cows, rainy season had lower GL than those of winter and summer seasons. Same trend was also observed by Potdar *et al.* (2017) in Jersey cross and non-descript cattle, and Nogalski and Piwczynski (2012) in HF cows. Contrary to the present study, Bakir and Cilek (2009), Petrovic *et al.* (2010), and Menale *et al.* (2011) reported that shorter GL was associated with high summer temperature.

The variation in GL in a particular season might be due to the dietary changes and local environmental factors (Potdar *et al.*, 2017).

**Table 4:** Month and season of calving wise gestation length in Gir cows

Parameters	No. of Observation	Gestation Length (days)
<b>Month of Calving</b>		
Jan	128	283.62 <sup>abc</sup> ± 0.55
Feb	101	283.35 <sup>abc</sup> ± 0.57
Mar	115	282.77 <sup>abc</sup> ± 0.51
Apr	108	282.55 <sup>ab</sup> ± 0.58
May	111	284.62 <sup>c</sup> ± 0.53
Jun	87	284.18 <sup>bc</sup> ± 0.65
Jul	78	282.95 <sup>abc</sup> ± 0.77
Aug	106	282.72 <sup>abc</sup> ± 0.53
Sep	108	282.20 <sup>a</sup> ± 0.57
Oct	116	283.55 <sup>abc</sup> ± 0.54
Nov	84	282.83 <sup>abc</sup> ± 0.73
Dec	130	283.92 <sup>abc</sup> ± 0.49
<b>Season of Calving</b>		
Winter (Nov-Feb)	443	283.50 ± 0.28
Summer (Mar-Jun)	421	283.49 ± 0.28
Rainy (Jul-Oct)	408	282.86 ± 0.29

Means bearing different superscripts within the column differ significantly between months at p<0.05.

## CONCLUSIONS

Results of the present study indicated that the overall mean gestation length of Gir cattle was 283.29 ± 0.16 days. The mean gestation length in Gir cows having female calves was 1.4 days shorter than those with male calves. The result clearly showed a period wise significant variation in gestation length of Gir cows. Season of service did not affect gestation length in Gir cattle. Gir cows that calved during May-June had longer GL that indicated this breed thrived more against environmental stress during summer season.

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