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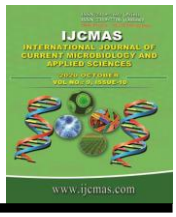

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Influence of Non-Genetic Factors on First Lactation 300 Days Milk Yield in Gir Cows

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A B S T R A C T

The present study was carried out using data of first lactation records of 513 Gir cows sired by 75 bulls spread over a period of 34 years (1981 to 2014), maintained at Cattle Breeding Farm, Junagadh Agricultural University, Junagadh. Analysis was carried out by least squares analysis method described by Harvey (1966) and followed by Duncan's multiple range test. The overall least squares means for first lactation 300 day or less milk yield (FL300DMY) was 1506.36 ± 40.10 kg. Season of calving had non-significant effect on FL300DMY. Period of calving had highly significant (P<0.01) effect on FL300DMY. Age at first calving had non-significant influence on FL300DMY, while calf birth weight had significant (P<0.05) effect on FL300DMY.

Introduction

Livestock play an important role in rural economy and contribute significantly to agricultural GDP of our country. India is believed to be a rich reservoir of livestock biodiversity with 43 registered cattle breeds. The total cattle population of India is 190.9

million of which 512.5 million is livestock population. Cattle contribute around 37.28 percent of the total livestock population of the country. Total cattle population of Gujarat state is 9.46 million out of which 1.40 million are Gir animals. Gir is well known high yielder milch breed of India and has originated from Gir forests and adjoining districts like Junagadh, Amreli, Bhavnagar, Gir-Somanth, Rajkot, Porbandar and also some parts of Jamnagar, Morbi and Surendranagar districts of Gujarat.

The milk yield is the basic and most important economic trait in dairy animal. The First lactation 300DMY provides most efficient measure to assess the inherent capacity of an individual and indicate the breeding value of a dairy animal accurately. Hence, 300 days lactation milk yield has great importance as a unit measure of profit. Being a trait of quantitative in nature, variation in milk yield is mainly brought about by heredity and environment.

Materials and Methods

The present investigation was conducted on data comprised of 513 Gir cattle completed first lactation in a span of 34 years from 1981 to 2014 from pedigree cum lactation registers and birth registers of Gir cattle maintained at Cattle Breeding Farm, Junagadh Agricultural University, Junagadh.

The data were classified into 7 periods(first six periods had five consecutive years and last period had four consecutive years). Each year was divided into four seasons viz., summer, rainy, autumn and winter. Data were also classified into five different groups according to the age at first calving and six different group according to calf birth weight.

Analysis was carried out by least squares analysis method to study the effect of various non-genetic factors on AFC described by Harvey (1966) using following model.

$$Y_{ijklm} = \mu + a_i + b_j + c_k + d_l + e_{ijklm}$$

Where

Y_{ijklm} = Observation on the mth individual in ith season, jth period, kth age group and lth birth weight of calf

μ = Overall population mean

a_i = Effect of ith season(i = 1 to 4)

b_j = Effect of jthperiod (j = 1 to 7)

c_k = Effect of kth age at first calving group (k = 1 to 5)

d_l = Effect of lthbirth weightof calf (l = 1 to 6)

e_{ijklm} = Random error, NID (0, σ^2_e)

Duncan'smultiple range test as modified by Kramer (1957) was used for testing differences among different least squares means (using the inverse coefficient matrix) to perform multiple comparison.

Results and Discussion

The overall least square mean of FL300DMY or less milk yield in the present study was 1506.36 □ 40.10 kg. Present finding are in agreement to the values reported by Bashir *et al.,* (2002)in Red Sindhi cow and Ramani (2016) in Gir cow.

The values of FL300DMY is considerably lower than those reported by Dangar and Vataliya (2015), Savaliya *et al.,* (2016) and Singh *et al.,* (2016) in Gir cattle and Dongre (2012) in Sahiwal cattle. While present finding is higher than those reported by Khatri *et al.,* (2004) in Red Sindhi cattle, Banik (2004)and Ilatsia *et al.,* (2007) in Sahiwal cattle. The differences in FL300DMY obtained by different workers might be due to differences in breeds, heards, management practices, location, number of observations and climate.

The differences in the estimates of average FL300DMY in Gir cattle reported by many workers might be due to sampling variations, number of observations, herd to herd differences, management practices, differences in breeds and time depending on the period for this particular trait.

Effect of season of calving on first lactation 300 day milk yield

The effect of different seasons of calving was found to be non- significant on the FL300DMY in Gir cows (Table 1). The least square mean of FL300DMY was observed to be highest in autumn calvers followed by winter, rainy and least in summer season calvers (Figure 1). The summer (1446.65 □ □ 69.23 kg) and rainy (1479.70 □ □ 64.47kg) season calvers produced minimum milk yield in the first lactation may be attributed to the higher humidity and the incidence of different diseases. The higher FL300DMY produced by animals which calved in autumn (1557.40 □ □ 72.48kg) and winter (1541.70 □ □ 47.43kg) might be due to more favourable temperature and availability of green fodder in sufficient quantity during these seasons.

Similarly, non-significant effect of seasons of calvingon FL300DMY was reported byUlmekand Patel(1993), Dangar and Vataliya (2015)and Ramani (2016)in Gircattle, Kathiravan *et al.,* (2009), Manoj (2009) andRaja (2010)in Sahiwal cattle, Divya *et al.,* (2014) and Singh *et al.,* (2016) inKaran Fries cattle.

While, significant effect of seasons of calving on FL300 DMY was reported by Singh *et al.,* (2016) in Gir cattle, Kakati *et al.,* (2017)in Frieswal cattle and Petrovic *et al.,* (2015)in Simmental cattle.

Effect of period of calving on first lactation 300 day milk yield

The effect of period of calving on FL300DMY was found to be highly significant (Table 1). The least squares means for FL300DMY was highest (1874.83 □ □ 105.91kg)for the animals that calved during 1986-1990may beat tributed to the higher lactation length, followed by P2, P4, P3, P5, P6 and lowest(1286.27 □ □ 73.29kg) for the period >2015 (Figure 2). The differences in FL300DMY over the periods may be attributed to environmental condition, management practice, fodder availability and differential culling levels on the basis of production.

Table.1 Least squares means for FL300DMY (kg) in Gir cows

Factors	N	Mean ±SE(kg)
Overall	513	1506.36 ± 40.10
Season of calving		
Summer	90	1446.65 ± 69.23
Rainy	113	1479.70 ± 64.47
Autumn	79	1557.40 ± 72.48
Winter	231	1541.70 ± 47.43
Period of calving		
1986-1990	34	1874.83 ± 105.91**[a]
1991-1995	96	1619.06 ± 72.28**[bc]
1996-2000	62	1463.61 ± 83.14**[c]
2001-2005	50	1510.64 ± 91.49**[bc]
2006-2010	102	1420.24 ± 65.94**[cd]
2011-2015	96	1369.89 ± 65.57**[cd]
>2015	73	1286.27 ± 73.29**[d]
Age at first calving(days)		
<1200	37	1445.88 ± 103.30
1201-1400	120	1444.22 ± 59.39
1401-1600	161	1499.19 ± 55.21
1601-1800	105	1576.44 ± 62.66
>1800	90	1566.09 ±68.10
Calf birth weight(kg)		
<18	55	1375.03 ± 53.49*[a]
18-20	146	1399.07 ± 82.55*[a]
20.1-22	155	1462.33 ± 51.32*[b]
22.1-24	97	1576.08 ± 63.70*[bc]
24.1-26	38	1629.01 ± 100.11*[c]
>26	22	1596.66 ± 131.82*[bc]

Anova table

Effects	Season	Period	AFC	Calf birth weight	Error
D.F.	3	6	4	5	494
FL300DMY	268010.81	1742510.02**	325663.36	701298.49*	341266.84

[** Highly significant at 1% level (P< 0.01),*significant at 5% level (P< 0.05), Means with the same superscript are not significantly different, N- No. of Observation]

Figure.1 Season of calving wise least squares means of FL300DMY (kg)

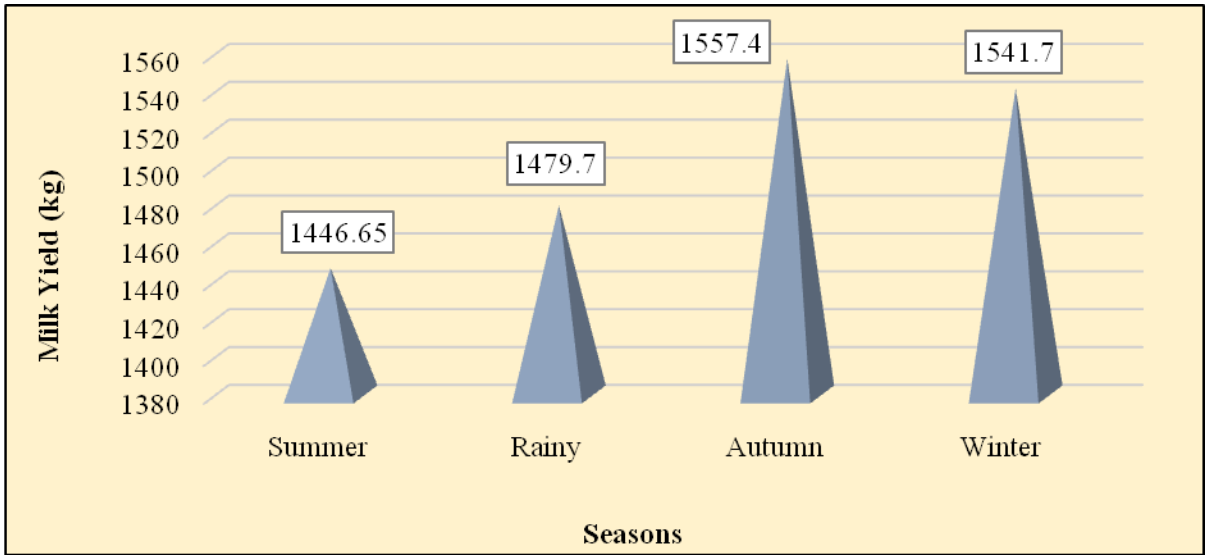


Figure.2 Period of calving wise least squares means of FL300DMY (kg)

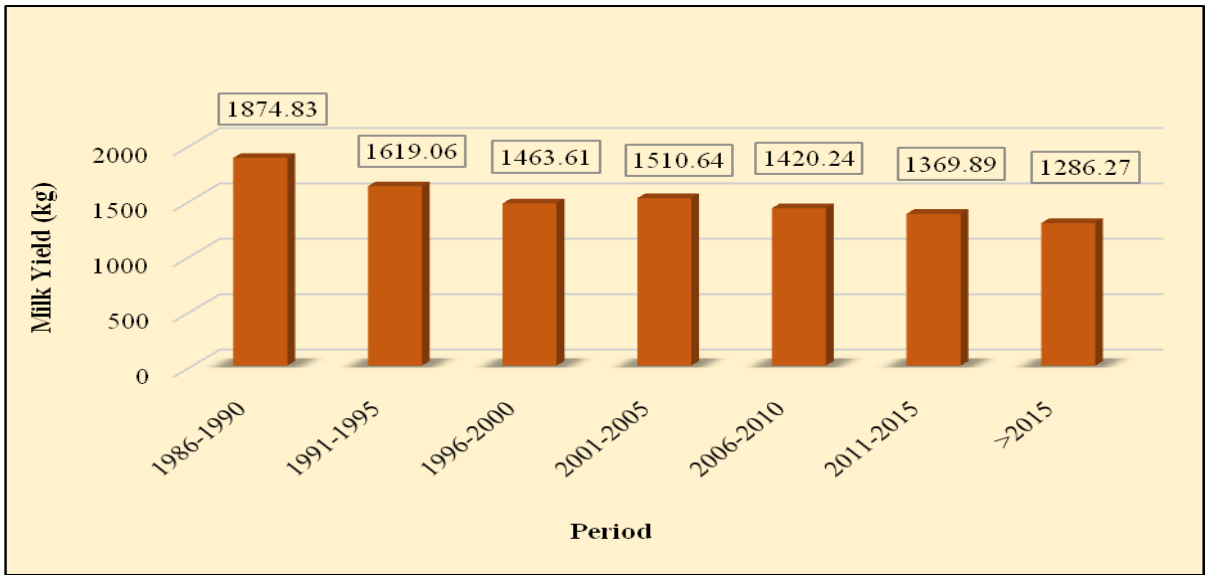


Figure.3 Age at first calving wise least squares means of FL300DMY (kg)

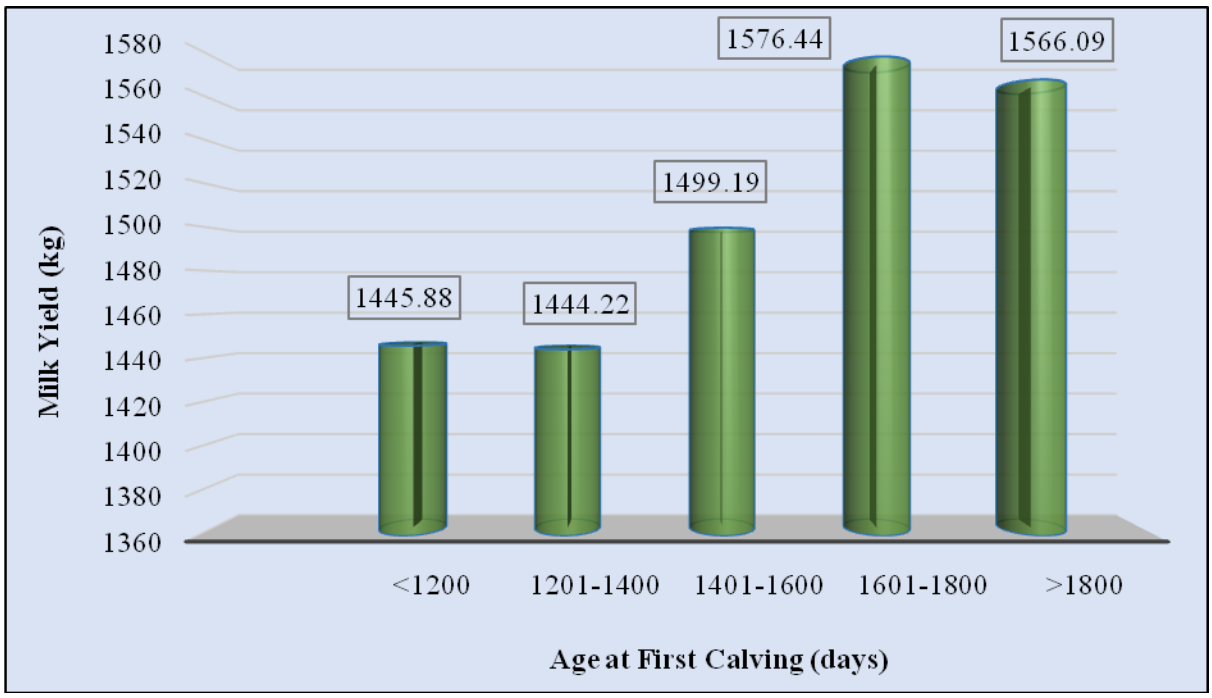
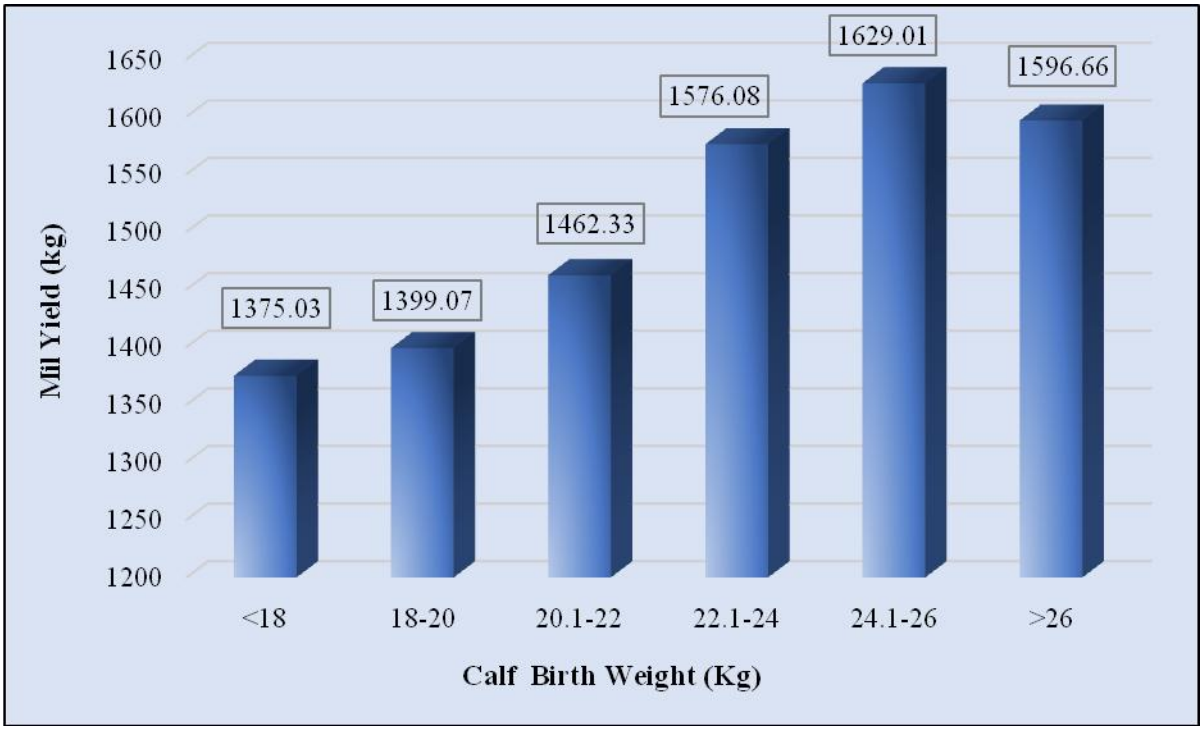


Figure.4 Calf birth weight wise least squares means of FL300DMY (kg)



In accordance with the present study, significance effect of period of calving on FL300DMY was reported by Gajbhiye and Dhanda (1987) in Gir cows, Monalisa *et al.,* (2010), Manoj *et al.,* (2012), Dongre *et al.,* (2013) and Narwaria *et al.,* (2015) in Sahiwalcattle and Hussain *et al.,* (2015) in Tharparkar cattle and Rose (2008) in Karan Fries cattle.

Contrary to this, non-significant effect of period of calving on FL305DMY in Sahiwal cattle observed byKushwaha *et al.,* (2003) and Kannan and Gandhi (2004). Similarly, Pandey (2001) in Hariana cattle and Ramani (2016) and Singh *et al.,* (2016) in Gir cows.

Effect of age at first calving on first lactation 300 day milk yield

The effect of age at first calving on FL300DMY was found to be non-significant in Gir cows (Table 1).

The least square means of FL300DMY was highest (1576.44 □ □ 62.66kg) in age group A4 than after A5, A3, A1 and lowest (1444.22 □ □ 59.39kg) in age group A2. In Gir cattle, definite increasing trend was seen in FL300 DMY between A2 to A4 AFC group (Figure 3). The reason behind that cows had proper maturing, will have optimum body weight/condition and well developed reproductive system, such cows are likely to perform better for first lactation traits. But non-significant effect of AFC on FL300DMY which may be attributed to better and uniform management of animals maintained during early part of their life.

Non-significant effect of AFC on FL300DMYwas found by Banik and Gandhi (2007), Sentitula (2007), Debbarma (2010), Raja (2010) and Singh *et al.,* (2016) in Sahiwal cattle. Similarly, Take and Murat (2013)in Turkish Holsteins and Divya *et al.,* (2014) and Singh *et al.,* (2016) in Karan-Fries cows.

Contrary to this, Dhaka *et al.,* (2002) in Hariana cows, Rehman *et al.,* (2008), Manoj (2009) and Monalisa *et al.,* (2010) in Sahiwal cattle, Saini *et al.,* (2014) in Rathi cows and Ramani (2016) in Gir cow reported significant effect of AFC on FL300DMY.

Effect of calf birth weight on first lactation 300 day milk yield

The effect of calf birth weight was found to be significant on the FL300DMY in Gir cows (Table 1). Cows calved with lower calf birth weight between <18 kg(1375.03 □ □ 53.49kg)produced less milk production as compared to cows that calved with higher calf birth weight between 24.1-26 kg(1629.01 □ □ 100.11 kg), the trend of milk production increased within normal calf birth weight (Figure 4). The results indicated that calf birth weight significantly affected ($P \leq 0.05$) on the FL300DMY might be due provided better nutritious diet, better health and reproductive management in last trimester of pregnancy in Gir cows.

Similar results were reported by Chew *et al.,* (1981) and Rahbar *et al.,* (2016) in Holsteins cow, Ghoraishy and Rokouei (2013) in Iranian Holstein cattle and Visker *et al.,* (2015) in Holstein Friesian cow.

In conclusions, the first lactation 300 day or less milk yield was not significantly influenced by season of calving and age at first calving. However, it was affected significantly($P<0.01$) by period of calving and calf birth weight in Gir cow.

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