Effect of parity on dairy temperament and productivity in Holstein Friesian crossbred cows

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Abstract

A study was conducted to evaluate the effect of parity on dairy temperament and production performance in primiparous and multiparous HF crossbred cows. The study revealed that the temperament score was significantly higher in primiparous as compared to multiparous cows. The let-down time was significantly higher in primiparous cows as compared to multiparous in all the weeks. Overall milking time (min) was significantly higher in multiparous cows as compared to primiparous cows with test day milk yield also significantly ($P<0.01$) higher in multiparous cows as compared to primiparous cows on all the test days starting from 1st to 9th week. However, milk flow rate and persistency of milk yield were statistically non-significant between primiparous and multiparous cows. Therefore the result of the present study revealed that parity is a factor that affects the dairy temperament and production performance in primiparous and multiparous cows.

Keywords: Dairy cow, Holstein Friesian, parity, production, temperament.

Introduction

Holstein Friesian (HF) crossbred cows are one of the high yielding categories of animals in cattle. As per the 20th Livestock Census, the exotic and crossed bred animals contributes nearly 26.9 % of the total cattle population of which HF crossbred accounts for 39.3% of total crossbred cattle in India. Due to higher productivity and reproductive efficiency Holstein Friesian has become most preferred breed of cow in the AI programs not only in Asia but also in African countries in Arab region (Maamouri et al 2019) and sub Saharan region (Senbeta and Abeba, 2021). HF crossbred is one of the best milkers among crossbred cattle with an average milk yield/ lactation of 6150 litres (Nath *et al*., 2016). To boost the economic performance of a dairy farm milk yield is an important parameter, which may be affected by the dairy temperament also a docile behaviour will make the milking task easier. So it is important to study a cows milking behaviour in different phase of parity. The temperament of a cow changes during the milking process which is evident between cows of different parity (Szentleleki *et al.,* 2015). A cow's milking profile may also be affected by the stage of lactation. In Murrah buffaloes the milk let-down time showed a linear decreasing tendency as the parity advances (Patel *et al.,* 2017). The average maximum letdown time (71.15 s) was observed in 1st lactation while the average minimum letdown time (56.65 s) was observed in 4th lactation and the difference was highly significant (P<0.01). Milking time varied significantly across parity. The lowest milking time is during 1st lactation (336.25s) (Patel *et al*. 2017). Primiparous cows have lower milk yield than multiparous cows suggesting milk yield to be affected by parity (Sourabh *et al.* 2016)

Parity has a significant (P<0.001) effect on the milk flow rate and the lowest milk flow rates originated from cows in first parity with 2.0 kg/min and increased by 8% in higher parities (Firk, 2002). With parity, the persistency of milk yield gets affected significantly (P<0.01) with maximum persistency (0.860±0.005) obtained during the first parity (Pareek and Narang, 2015).

With artificial insemination service available to farmers at their doorstep, HF crossbreed cows have become an integral part of the dairy sector of India so a detailed study of their milking performance in every stage of parity is crucial. Thus considering all the previous findings the present investigation is planned to understand the changes in HF crossbred cows during different post parturient periods with the objective to study their temperament profile and milking characteristics.

Material and methods

The present study was conducted at Bhestan, a non-government organisation run farm, situated at 21°10′N and 72°50′E in Surat, Gujarat state; India on a 12 HF crossbred cows that were divided into two groups. Group-I consists of six primiparous and Group-II of six multiparous cows respectively. The study was undertaken during monsoon till the winter season.

For observing the animal's behaviour, video recording was done with a low light-intensity camera and a time-lapse digital video recorder. To facilitate behavioural data recording at night the calving pens were illuminated with artificial light. All the animals were kept under uniform feeding and managemental conditions throughout the experimental period. The animals were solely fed on a Total Mixed Ration (TMR) twice daily i.e. 8.00 am and 4.00 pm respectively. The nutrient composition of the TMR is shown in table 1. Milking was performed by hand milking method twice daily (morning and evening) at 2:30 am and 2:30 pm hours by full hand method using both the hands from beginning till the end of stripping with a consistent speed. The following observations were recorded at the time of milking. Milking behavior was observed weekly during the period of research work (2 months).

Dairy temperament

The technique suggested by Tulloh (1961) was followed for the observation of dairy temperament in lactating cattle. In rating the temperament of dairy cows the categories were classified as docile, slightly restless, restless, nervous and aggressive. The numbers 1, 2, 3, 4 and 5 can be fixed for docility, slightly restlessness, restlessness, nervousness and aggressiveness. Adopting the rating scale method, each cattle was rated twice in a month. The score sheet according to which the rating was done is given in Table 2.

Let down time (LDM): In the experiment the HF calves were permitted to suckle for a few minutes before the let down of milk and 5 minutes after each milking. The time (Sec.) required from touching of teat by a calf or manual massage to the first drop of milk drawn in the pail was recorded as LDM of the cows. It was recorded with the help of a stop watch.

Milking time (MT): Time (Sec.) required for milking the animal completely after a let down of milk was recorded with the help of stop watch.

Test day milk yield: The yield was recorded and measured in kg with the help of digital weight balance at each milking.

Table 1: Proximate analysis of TMR feed

Nutrient	Amount
Crude protein %	11.06
Ether extract %	2.31
Crude fibre %	26.28
Ash%	13.77
Moisture%	14.25
Nitrogen free extract% on dry matter basis	46.58

Table 2. Description of different levels of milking temperament

Temperament	Description	Score
Docile	The cows which stand quietly, rarely move except to raise or lower their heads, do not give any trouble, extremely docile during milking and preparation; the "ideal" milker; generally not affected by the whole procedure.	1
Slightly restless	The cows which are generally docile but move frequently flick tail occasionally; not very much bothered about preparation and milking but sometimes shift weight from side to side; they give very less trouble.	2
Restless	The cows which move almost continuously; flick tail frequently; snorts; may lift feet occasionally during preparation; but do no kick; may be stubborn.	3
Nervous	Appear very restless during preparation for milking; generally quiver when the hand is placed on their back; flick tail frequently.	4
Aggressive	Very restless cows which struggles violently, bellows and froths at the mouth; attack the observer by kicking or butting; move from side to side.	5

Milk flow rate (MFR): This was calculated by dividing total milk yield by total milking time (kg/min.).

Persistency of milk yield (P): Ludwick and Peterson (1943) defined the persistency of the consecutive ratios obtained by comparing the production of each individual sub division of lactation period with the preceding one as:

$$P = W_1 x\ P_1/P_2 + W_2 x\ P_3/P_2 + W_3 x\ P_4/P_3$$

Where, P_1= milk yield during 2^{nd} + 3^{rd} week

P_2= milk yield during 4^{th} + 5^{th} week

P_3= milk yield during 6^{th}+ 7^{th} week

P_4= milk yield during 8^{th}+ 9^{th} week

$W_1 = R_1/R_1 + R_2 + R_3$

$W_2 = R_2/ R_1 + R_2 + R_3$

$W_3 = R_3 / R_1 + R_2 + R_3$

$R_1 = P_2 / P_1$

$R_2 = P_3/P_2$

$R_3 = P_4/P_3$

The persistency of milk yield of primiparous and multiparous groups during the whole experimental period was calculated by using the above formula, milk yield on a weekly basis of the whole 60 days period was taken to get the persistency.

Statistical analysis

The data on production performance traits and dairy temperament were subjected to statistical analysis using SPSS (Statistical Package for Social Sciences, Version 20.0) software. Descriptive statistics specifying Mean±S.E were calculated for each group. One-way ANOVA procedure was undertaken to compare means. Post Hoc multiple comparisons were made using the Duncan New Multiple Range Test (DNMRT). Independent sample t-test was used for two group comparisons.

Results

Dairy temperament

The overall mean dairy temperament (depicted in table 3) recorded was 2.17±0.08 and 1.17±0.13 respectively in primiparous and multiparous cows respectively. The highest temperament score of 2.37 ±0.03 (restless) with the

lowest milk yield of 2.83 ±0.04 litres per milking was found in the first lactation cows. While the lowest temperament score of 1.03 ±0.03 with the highest milk yield of 4.34 ±0.04 litres per milking in the fourth lactation cows.

Shehar *et al* (2015) also reported that the difference in temperament due to parity was significant. He found that as the parity advances the temperament of cow improves i.e. they become comparatively more docile which might be due to the fact that as the age advances the cow becomes more familiar with the routine farm operations, particularly milking.

Production performance traits

Effect of parity on Let-Down Milking time (sec.) of HF crossbred cows

Overall Mean ± SE value of let-down milking time in different parity has been shown in Table 4. Let-down milking per milking was recorded as 63.54±0.79 sec. and 51.11±0.64 sec. in primiparous and multiparous cows respectively. The difference between the mean LDM of primiparous cows were significantly different from multiparous cows in all the weeks.

The finding of the present study is in agreement with the result reported by Shehar *et al*. (2011) and Patel *et al*. (2017). Their studies also reported that primiparous cows had a higher let-down of milking time than multiparous cows. This may be because milking in unknown ambient results in milk ejection inhibition mainly in primiparous cows when milked for the first time.

Effect of parity on Milking time (min) in HF crossbred cows.

As per the results shown in Table 5 the overall Milking time (min) for primiparous and multiparous cows was 5.50±0.03 min and 6.97±0.10 min respectively. The data were statistically significant. The said data between primiparous and multiparous was significant for all the weeks. The highest MT in primiparous was observed during 9th week and lowest during 7th week. The MT in multiparous cows was highest during 7rd week and lowest during 2nd week.

The study of Shehar *et al*. (2011) in Gir cows and Patel *et al*. (2017) are in agreement with the present study, they also reported that multiparous cows required significantly more milking time than the primiparous cows.

Effect of parity on Test Day Milk Yield (kg.) in HF crossbred cows

The overall mean of test day milk yield (table 6) was 8.48±0.056 kg and 10.83±0.15 kg in primiparous and multiparous cows respectively. Test day milk yield was significantly (P<0.01) higher in multiparous cows as compared to primiparous cows on all the test days starting from 1st to 9th week. The highest test day milk yield was recorded on 8th week and lowest on 1st week in primiparous cows. Whereas the highest test day milk yield was observed on 6th week and lowest in 1st week in multiparous cows.

The result of the present study is in agreement with the reports of Pawar *et al.* (2012), Sundaram *et al*. (2013), Wondifraw *et al*. (2013), Verma *et al*. (2015) and Sourabh *et al.* (2016). They have reported that primiparous cows had lower milk yield than multiparous cows. The low milk production of primiparous cows in the present study could be due to its growing stage, as in mature animals mammary parenchymas were more developed due to optimum hormonal levels. However, Sarkar *et al*. (2006) and Radhika *et al*. (2012) reported a non-significant effect of parity on milk yield per day.

Table 3- Effect of parity and test day on Dairy Temperament Score in HF crossbred cows.

Fortnightly	No. of observation	Primiparous	Multiparous	t-value	p-value
		Mean ± S.E.	Mean ± S.E.		
1	6	2.33±0.21	1.83±0.31	1.342	0.209
2	6	2.17±0.17	1.83±0.31	0.953	0.363
3	6	2.17±0.17	1.67±0.21	1.861	0.092
4	6	2.00±0.00	1.50±0.22	2.236	0.049
Overall	24	2.17±0.08	1.17±0.13	3.071	0.004

Table 4- Effect of parity and test day on Let Down of Milking time (sec.) in HF crossbred cows.

Weeks of observation	No. of observation	Primiparous	Multiparous	t-value	p-value
		Mean ± S.E.	Mean ± S.E.		
1	6	69.33^{ab}±2.01	51.17±2.63	5.493	0.000
2	6	68.33^{a}±2.35	50.83±2.95	4.643	0.001
3	6	66.50^{ab}±1.75	51.67±1.89	5.762	0.001
4	6	65.50^{b}±1.45	51.17±2.54	4.903	0.001
5	6	61.50^{b}±2.22	52.50±1.48	3.378	0.007
6	6	60.67^{ab}±2.22	52.67±0.95	3.315	0.008
7	6	59.33^{ab}±1.43	49.83±1.66	4.334	0.001
8	6	60.17^{ab}±2.10	49.33±1.36	4.326	0.001
9	6	60.50^{ab}±2.05	50.83±1.96	3.415	0.007
Overall	54	63.54±0.79	51.11±0.64	12.246	0.000

[Means with different superscript (a, b) within columns are statistical different.]

Effect of parity on Milk Flow Rate (kg/min) of HF crossbred cows.

The overall mean milk flow rate (kg/min) for primiparous and multiparous cows (table 7) was 1.54±0.01 and 1.57±0.03 respectively. The data were statistically non-significant between groups. The highest milk flow rate was observed during 8th week and lowest was observed during 1st week in primiparous cows, while in multiparous cows similar milk flow rate was observed during 4th and 5th weeks.

In multiparous cows, milk yield was higher than primiparous cows in our finding, the reason for the higher milk flow rate in multiparous cows, is probably their high milk yield. The finding of the present study is supported by the finding of Firk (2002) who found significant difference between parities of cows they observed that speed of milking was lowest in the 1st parity which increased in the subsequent parities. Higher milk flow in older cows might have been associated with possible weakening of the teat end with age.

Effect of parity on persistency of milk yield (kg) in HF crossbred cows.

The effect of parity on persistence of milk yield was studied by calculating data fortnightly and the same is presented in Table 8. The data were calculated for 60 days of lactation in both the groups. The overall mean persistence of milk yield of (kg.) was higher in primiparous as compared to multiparous cows though it was not significant.

The present study is in agreement with Garudkar *et al.* (2018) who reported that the effect of parity was non-significant on persistency of milk yield in their study. However, the finding of present study is not in line with Sahinler (2009) who reported a significant effect of parity on persistency of milk yield.

Table 5- Effect of parity and test day on Milking time (min) in HF crossbred cows.

Weeks of observationWeekly	No. of observation	Primiparous	Multiparous	t-value	p-value
		Mean ± S.E.	Mean ± S.E.		
1	6	5.42±0.05	6.88±0.33	-4.358	0.001
2	6	5.52±0.12	6.83±0.38	-3.286	0.008
3	6	5.42±0.07	6.97±0.36	-4.284	0.002
4	6	5.44±0.04	6.88±0.31	-4.681	0.001
5	6	5.53±0.11	6.87±0.35	-3.688	0.004
6	6	5.63±0.15	6.99±0.32	-3.883	0.003
7	6	5.39±0.06	7.19±0.29	-5.979	0.000
8	6	5.48±0.05	7.13±0.24	-6.726	0.000
9	6	5.64±0.13	7.04±0.31	-4.105	0.002
Overall	54	5.50±0.03	6.97±0.10	-14.050	0.000

Table 6-Effect of parity and test day on test day Milk Yield (Kg) in HF crossbred cows

Weeks of observation	No. of observation	Primiparous	Multiparous	t-value	p-value
		Mean ± S.E.	Mean ± S.E.		
1	6	8.14±0.14	9.37^{a}±0.18	-5.377	0.000
2	6	8.28±0.09	10.29^{ab}±0.38	-5.141	0.000
3	6	8.30±0.29	10.29^{ab}±0.47	-3.602	0.005
4	6	8.49±0.11	11.08^{bc}±0.34	-7.203	0.000
5	6	8.53±0.09	11.03^{bc}±0.41	-5.954	0.000
6	6	8.64±0.15	11.79^{c}±0.38	-7.709	0.000
7	6	8.49±0.15	11.22^{bc}±0.33	-7.597	0.000
8	6	8.81±0.20	11.71^{c}±0.38	-6.713	0.000
9	6	8.61±0.19	10.71^{bc}±0.32	-5.660	0.000
Overall	54	8.48±0.06	10.83±0.15	-14.720	0.000

[Means with different superscript (a, b, c) within columns are statistical different.]

Table 7- Effect of parity and test day on Milk Flow Rate (kg/min) in HF crossbred cows

Weeks of observation	No. of observation	Primiparous Mean ± S.E.	Multiparous Mean ± S.E.	t-value	p-value
1	6	1.50±0.03	1.38±0.06	1.859	0.093
2	6	1.50±0.04	1.54±0.12	-0.251	0.807
3	6	1.54±0.06	1.49±0.09	0.424	0.680
4	6	1.56±0.01	1.62±0.09	-0.743	0.475
5	6	1.55±0.04	1.62±0.08	-0.862	0.409
6	6	1.54±0.03	1.70±0.10	-1.645	0.131
7	6	1.57±0.03	1.57±0.07	0.042	0.968
8	6	1.61±0.04	1.65±0.07	-0.530	0.608
9	6	1.53±0.06	1.53±0.05	0.030	0.977
Overall	54	1.54±0.01	1.57±0.03	-0.735	0.464

Table 8-. Effect of parity and test day on Persistence of milk yield in HF crossbred cows.

Parity	No of animals	Mean ± SE	t-value	p-value
Primiparous	6	1.16±0.16	0.848	0.416
Multiparous	6	1.03±0.01		

Conclusions

Thus it may be concluded that dairy temperament varies with the parity of cows as because multiparous cows were more docile than primiparous cows with respect to dairy temperament and that parity also affects the milk production performance in HF cows as found in the present study. The study thus provides a scope to understand how to effectively manage dairy cows as per their lactation stage which is important, in order to properly attain their production potential without causing any adverse impact on their health.

Conflict of interest

The authors declare no conflict of interest.

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