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Simran Singh
Division of Animal Genetics & Breeding, FVSc & AH, SKUAST-Jammu, R.S. Pura, Jammu, Jammu & Kashmir, India

D Chakraborty
Division of Animal Genetics & Breeding, FVSc&AH, SKUAST-Jammu, R.S.Pura, Jammu & Kashmir, India

AK Das
ICAR-CIRC, Meerut Cantt, Uttar Pradesh, India

RK Taggar
Division of Animal Genetics & Breeding, FVSc & AH, SKUAST-Jammu, R.S. Pura, Jammu, Jammu & Kashmir, India

N Kumar
Division of Animal Genetics & Breeding, FVSc & AH, SKUAST-Jammu, R.S. Pura, Jammu, Jammu & Kashmir, India

D Kumar
Division of Animal Genetics & Breeding, FVSc & AH, SKUAST-Jammu, R.S. Pura, Jammu, Jammu & Kashmir, India

Correspondence
D Chakraborty
Division of Animal Genetics & Breeding, FVSc&AH, SKUAST-Jammu, R.S.Pura, Jammu & Kashmir, India

Factors affecting lifetime performance traits in frieswal cows

Simran Singh, D Chakraborty, AK Das, RK Taggar, N Kumar and D Kumar

Abstract
A total of 205 lactation records of Frieswal (Holstein Friesian X Sahiwal) crossbred cows, from 1st to 3rd parity over a period of 9 years from 1998 to 2006 maintained at Military farm, Jammu Cantonment (J&K) are used to estimate the Lifetime performance traits. The averages for Total Dry Period (TDP), Total Calving Interval (TCI), Total Lactation Length (TLL), Total Milk Yield (TMY), Total Milk Yield per Lactation Length (TMY/LL) are 356.04 ± 10.87 days, 1233.09 ± 25.55 days, 878.86 ± 19.50 days, 8702.24 ± 256.14 Kg and 9.71 ± 0.14 with corresponding coefficient of variations 43.88%, 29.74%, 31.85%, 42.25% and 20.91% respectively. In present study, genetic groups and parity have significant effect on TCI, TLL, TMY and TMY/LL whereas period had non-significant effect on TMY and TMY/LL only. The present study suggests that different factors are affecting the lifetime performance traits in Frieswal cows.

Keywords: frieswal cows, lifetime traits, total milk yield, total milk yield per day of lactation

Introduction
Crossbreeding of local cattle with exotic dairy breeds is done to cater the need of milk. Project Directorate on Cattle (now CIRC, Central Institute for Research on Cattle), Meerut developed a synthetic breed "Frieswal" (5/8 Holstein Friesian and 3/8 Sahiwal), yielding 4000 kg of milk with 4% butter fat in a lactation of 300 days in collaboration with Ministry of Defence utilizing Military Dairy Farms herds [1].

Overall productivity of a dairy animal depends on its lifetime performance rather than its performance in a single lactation thus making it a key factor in economics of a successful dairy enterprise. It can be used as selection criteria for simultaneous improvement of both milk production and reproductive efficiency. Evaluating the lifetime performance of cows maintained under different agro climatic conditions is important for overall assessment of breed performance and adaptability [2]. The present research was conducted to estimate lifetime performance traits for various Holstein Friesian and Sahiwal grades and the genetic and non- genetic factors affecting them.

Materials and Methods
Data on a total of 205 lactations of Frieswal cows belonging to three genetic groups (Pure bred HF, HF 62.5% and HF 50%-62.5%) maintained at Military Farm Jammu Cantonment during 1998 to 2006 year of birth were utilized to study the effect of genotype, period and parity on lifetime performance traits viz. Total Dry Period (TDP), Total Calving Interval (TCI), Total Lactation Length (TLL), Total Milk Yield (TMY), Total Milk Yield per Lactation Length (TMY/LL). The data were classified into three periods each period with three years P1 (1998-2000), P2 (2001-2003) and P3 (2004-2006).

The mean, standard errors and coefficient of variations (CV) were computed statistically [3]. The effects of non-genetic factors such as genotypes, periods and parity on these lifetime traits were analyzed by least squares analysis using the technique [4]. The following model was used for present investigation with assumptions that the different components being fitted into the model were linear, independent and additive.

$$Y_{ijkl} = \mu + G_i + Y_j + P_k + e_{ijkl}$$

Where,

Y_{ijkl} = l^{th} record of individual of i^{th} genotype born j^{th} period of k^{th} parity

μ = Overall population mean
G_i = Fixed effect of i^{th} genotype
Y_j = Fixed effect of j^{th} period of calving
P_k = Fixed effect of k^{th} parity
e_{ijkl} = Error associated with each observation and assumed to be normally and independently distributed with mean zero and variance $(0, \sigma^2_e)$

The least squares means of significant effects were compared using Duncan's multiple range test (DMRT) as modified [5].

Results and Discussions

Overall means and standard errors for different lifetime performance traits of Frieswal cattle have been presented on Table 1. The coefficient of variations (CV) ranged from low to medium. The value was lowest for TMY/LL (20.91%) and the highest value was found for TDP (43.88%). The low to medium CV suggests that there is low variability in the traits. Therefore, the selection on superior animals on the collateral basis along with better feeding and management would be appropriate for improvement of these traits.

The overall least-squares means were 378.82 ± 12.03 days, 1308.43 ± 16.61days, 930.88 ± 13.27 days, 9535.56 ± 183.92 kg and 10.01 ± 0.17 kg, respectively for TDP, TCI, TLL, TMY and TMY/LL. Lower overall least square means for TMY was reported in crossbred cattle [6]. Lower value of TMY/LL was reported in Jersey cows [7]. However, higher values for TMY and TLL were reported in crossbred cattle [8]. Singh and Singh (2016) reported higher mean value for TLL and lower TMY value than the present findings in Sahiwal cows. On the other hand, lower value in Jersey and its crosses with Tharpakar and Jersey x Red Sindhi crossbred cow for milk yield per day of productive life for TMY/LL were reported [9, 10].

Effect of Genotype

The effect of genotype was significant in all the traits of the present study except for total dry period (TDP). The G1 genotypes (100% HF) were superior for production traits (TLL, TMY and TMY/LL) whereas, G3 genotypes (50-62.5%) were superior for reproduction traits (TCI and TDP). Different significant effects of lifetime production traits suggest that 100% HF are better producer but 50-62.5% HF inheritance are better for reductive traits. On contrary to the present findings, non-significant effects of genotypes were reported on TMY and TLL in crossbred cattle [8].

Effect of Period

Period had significant effect on all the lifetime traits in Frieswal cows except for TMY and TMY/LL, where non-significant effect of period was observed. There was decreasing trends for reproductive traits over the periods which are desirable one. The TMY and TMY/LL have also been decreased over the periods but the values were non-significant. Similarly, significant effect of period was reported for TMY/LL in Jersey cows [7] for TLL and TMY in Sahiwal cows [11].

Effect of Parity

Parity had significant effect on all the lifetime traits except for total dry period (TDP) in Frieswal cows. With the increase in parity, the more production values were obtained for lifetime production records. Similarly, significant parity was found on TMY in crossbred cattle [11].

Table 1: Average Lifetime performance in Frieswal cows

	Mean ± SE	SD	CV (%)
TDP (Days)	356.04 ± 10.87	156.24	43.88
TCI (Days)	1233.09 ± 25.55	366.66	29.74
TLL (Days)	878.86 ± 19.50	279.90	31.85
TMY (Kg)	8702.24 ± 256.14	3676.27	42.25
TMY/LL (Kg)	9.71 ± 0.14	2.03	20.91

Table 2: Least-squares means for Lifetime performances of Frieswal cows

	No. of Obs.n	TDP (Days)	TCI (Days)	TLL (Days)	TMY (Kg)	TMY/LL (Kg)
Overall	206	378.82±12.03	1308.43±16.61	930.88±13.27	9535.56±183.92	10.01±0.17
Genotype		NS	*	**	**	*
G1 (100% HF)	21	359.62±29.01	1370.20^{c}±40.05	1007.50^{b}±31.99	11132.48^{b}±443.41	10.76^{b}±0.42
G2 (62.5% HF)	118	408.62±13.54	1303.97^{b}±18.70	904.88^{a}±14.93	8796.09^{a}±207.03	9.60^{a}±0.20
G3 (50-62.5 % HF)	67	368.22±16.85	1251.12^{a}±23.27	880.25^{a}±18.58	8678.10^{a}±257.60	9.69^{a}±0.24
Period		**	**	*	NS	NS
P1 (1998-2000)	36	500.06^{c}±29.17	1487.82^{c}±40.27	998.57^{c}±32.16	10069.35±445.85	9.88±0.42
P2 (2001-2003)	75	364.68^{b}±16.79	1280.99^{b}±23.18	915.10^{b}±18.51	9653.96±256.64	10.37±0.24
P3 (2004-2006)	95	271.71^{a}±19.69	1156.48^{a}±27.18	878.96^{a}±21.71	8883.36±300.94	9.78±0.28
Parity		NS	**	**	**	**
2	74	350.22±22.10	1034.08^{a}±30.51	685.31^{a}±24.37	6613.84^{a}±337.80	9.31^{a}±0.32
3	67	395.82±20.12	1335.25^{b}±27.78	942.74^{b}±22.19	9380.32^{b}±307.57	9.95^{b}±0.29
4	65	390.41±19.86	1555.96^{c}±27.42	1164.57^{c}±21.90	12612.51^{c}±303.64	10.78^{c}±0.29

* P<0.05, ** P<0.01, NS-Non-Significant
Means with different superscripts differ significantly

Conclusion

The present study indicates that different non-genetic factors are affecting the lifetime production traits of Frieswal cows significantly. As there are low to moderate CV (%) for all the traits, the traits can be improved through collateral selection and better health, feeding and manage mental practices. Introduction of good quality sires from different herds can also help in increasing variability.

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