INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

www.scienceandnature.org

FACTORS AFFECTING FIRST LACTATION PRODUCTION EFFICIENCY TRAITS OF FRIESWAL CATTLE

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ABSTRACT
The present investigation was undertaken on data of crossbred Freiswal cattle from Military Farm, Jammu Cantonment Military Dairy Farm (MDF) of Jammu to identify different factors affecting first lactation production efficiency traits. First lactation records of 205 crossbred cattle distributed over 9 years (1998 to 2006) were analyzed. First lactation production efficiency traits including both production and reproduction traits were first lactation milk yield (FLMY), average milk yield per day of lactation (FLMY/FLL), milk yield per day of first calving interval (MCI) and milk yield per day of age at second calving (MSC). The statistical analysis was carried out using LSMLMW computer programme. The overall least-squares means were 3130.27 ±91.93 kg, 10.23 ±0.23 kg, 7.15 ±0.21 kg and 2.35 ±0.07 kg, respectively for FLMY, FLMY/FLL, MCI and MSC. The co-efficient of variations for different traits were low. Period of calving had significant effect on all the traits except for MSC. Moreover, there was decreasing trend for different traits over different periods. Season of calving had non-significant effect on all the traits under study. Genetic group had non-significant effect on all the traits under study although, there was decreasing trends over genetic groups for different traits. It can be concluded from the study that production efficiency traits of Frieswal cattle is influenced by different factors.

KEYWORDS: First lactation milk yield, Frieswal cattle, Non-genetic factors, Production efficiency traits.

INTRODUCTION

The milk production of animal depends upon the reproduction activity of the animal. But, in several studies antagonistic genetic and phenotypic correlations between reproduction and the production of the animal were reported. To obtain a simultaneous improvement in productive and reproductive traits by overcoming this antagonism, it will be useful to use a practical measure that combines these traits and shows the overall efficiency of an animal. Milk yield per day of lactation length, milk yield per day of calving interval and milk yield per day of age at second calving may be thought of as combinations of production and reproduction and can be used as selection tool. The productive efficiency performance of dairy animal is determined by milk yields and duration of lactation. Production efficiency traits are important parameters for ensuring profitability of dairy animal over longer period. The production efficiency traits help in determining the marketing value of the animal. Overall production efficiency in the herd is the most important. Therefore, the present study was undertaken to evaluate the performances of Frieswal cows at varying level of exotic inheritance to the effect of different non-genetic factors.

MATERIALS & METHODS

The present study was conducted on data pertaining to 205 Frieswal crossbred cattle maintained at Military Farm, Jammu Cantonment Military Dairy Farm (MDF) of Jammu over a period of 9 years from 1987 to 2006. The duration of 9 years were divided into 3 periods of three years each. The three seasons were delineated as summer, rainy and winter seasons on the basis of geo-climatic conditions prevailing in the region. The different genetic groups were G1 (HF: 62.5-100%), G2 (Frieswal: 50 - 62.5%) and G3 (Frieswal: 62.5%). The production efficiency traits recorded were: first lactation milk yield (FLMY), average yield per day of first lactation (FLMY/FLL) = first lactation milk yield (FLMY) / first lactation length (FLL), lactation milk yield per day of first calving interval (MCI) = first lactation milk yield (FLMY) / first calving interval (FCI) and lactation milk yield per day of age at second calving (MSC) = first lactation milk yield (FLMY) / age at second calving [ASC= age at first caving (AFC) + first calving interval (FCI)]. Data with any recorded abnormalities and outliers were excluded prior to the analysis. The mean, standard errors and coefficient of variations (CV) of all economic traits like growth and production traits, were computed statistically given by Snedecor and Cochran (1968).

The effects of non-genetic factors such as periods, seasons and genetic groups on various normalized production efficiency traits were analyzed by least squares analysis using the technique developed by Harvey (1990). The following model was used for analyzing data for Frieswal crossbred cattle with assumptions that the different components being fitted into the model were linear, independent and additive.

$Y_{ijkl} = \mu + P_i + S_j + G_k + e_{ijkl}$

Where, Y_{ijkl} = The observation on l^{th} animal of the i^{th} period, j^{th} season and k^{th} genetic group

μ = overall mean.

P_i = effect of i^{th} period

S_j = effect of j^{th} season.

G_l = effect of k^{th} genetic group

e_{ijkl} = Random error term corresponding to Y_{ijkl}

For significant effects, the differences between pairs of levels of effects were tested by Duncan's multiple range test as modified by Kramer (1957).

RESULTS &DISCUSSION

The overall means for different production efficiency traits of Frieswal cattle have been presented in Table 1. The coefficient of variations of different traits were low-moderate. The low CV indicates that there is low variability in the production efficiency traits of Frieswal cows. Therefore, these traits can be improved by collateral selection along with better managemental practices.

TABLE 1: Average estimates along with standard errors of first lactation production efficiency traits in Frieswal cows

Traits	Mean ± SE	Standard Deviation	CV (%)
FLMY	2943.77 ± 69.71	998.09	33.91
FLMY/FLL	10.09±0.18	2.51	24.88
MCI	7.08±0.16	2.27	32.06
MSC	2.29±0.05	0.71	31.00

Overall least-squares means were 3130.27 ±91.93 kg, 10.23±0.23 kg, 7.15 ±0.21 kg and 2.35 ±0.07 kg, respectively for FLMY, FLMY/FLL, MCI and MSC in Frieswal cows. Lower FLMY, FLMY/FLL, MCI & MSC values were reported in Hariana cattle (Dhaka *et al.*, 2002); in Murrah buffaloes (Chakraborty *et al.*, 2010) & Sahiwal cows (Dhawan *et al.*, 2015); FLMY& FLMY/ FLL in Sahiwal cows (Singh and Singh, 2016) and FLMY, MCI and MSC in Hardhenu crossbred cattle (Verma *et al.*, 2016). Higher FLMY/FLL and MCI value was reported in Karan Fries crossbred cattle (Japheth *et al.*, 2015).

Effect of period

Least squares means depicted in Table 2 showed that period had significant effect on all the traits under study in Frieswal cattle except for MSC. The performance of first period calvers (1998-2000) was better for FLMY and that of second period calvers (2001–2003) was better for FLMY/FLL and MCI (Table 2). There was decreasing trends over the period in Frieswal cattle. This indicates that the sires used in the last period may be less genetic merit or inbreeding rate has been increased in the herd. The sires from other herds can also be introduced to reduce the inbreeding of the herd and improve these traits. Similarly significant effects of period on FLMY/FLL & MCI were reported in Hariana cattle (Dhaka *et al.*, 2002); in Karan Fries crossbred cattle (Japheth *et al.*, 2015); in Red Sindhi x Jersey crossbred cows (Verma and Thakur, 2013); in Sahiwal cows (Singh and Singh, 2016) and FLMY & MCI in Hardhenu crossbred cattle (Verma *et al.*, 2016). Chakraborty *et al.* (2010) also reported significant effect of period on FLMY/FLL in Murrah buffaloes. On contrary to present study Chakraborty *et al.* (2010) reported significant effect of period on MSC in Murrah buffaloes and Verma *et al.* (2016) in Hardhenu crossbred cattle.

TABLE 2: Least-Squares means

	No. of Obs.	FLMY	FLMY/FLL	MCI	MSC
Overall Mean	205	3130.27 ± 91.93	10.23 ± 0.23	7.15 ± 0.21	2.35 ± 0.07
Period		**	**	*	NS
P1 (1998-2000)	36	3404.71^{b} ± 159.91	10.44^{b} ± 0.41	7.25^{b} ± 0.37	2.41 ± 0.12
P2 (2001-2003)	74	3184.16^{b} ± 137.72	10.86^{b} ± 0.35	7.60^{b} ± 0.32	2.41 ± 0.10
P3 (2004-2006)	95	2801.93^{a} ± 130.72	9.39^{a} ± 0.33	6.61^{a} ± 0.31	2.23 ± 0.10
Season		NS	NS	NS	NS
S1 (Summer)	46	3139.73 ± 148.91	9.79 ± 0.38	6.75 ± 0.35	2.31 ± 0.11
S2 (Rainy)	38	3046.98 ± 165.32	10.50 ± 0.42	7.24 ± 0.39	2.32 ± 0.12
S3 (Winter)	121	3204.08 ± 108.95	10.40 ± 0.28	7.47 ± 0.25	2.43 ± 0.08
Genetic Group		NS	NS	NS	NS
G1 (HF: 62.5-100%)	20	3520.22 ± 219.97	10.48 ± 0.56	7.55± 0.51	2.55 ± 0.16
G2 (Frieswal: 50 - 62.5%)	119	2957.19 ± 99.41	10.16 ± 0.25	7.05 ± 0.23	2.28 ± 0.07
G3 (Frieswal: 62.5%)	66	2913.39 ± 128.91	10.06 ± 0.33	6.85 ± 0.30	2.22 ± 0.09

Effect of seasons

Seasons had non-significant effect on all the traits under present study. The performance of winter calvers was better than the other 2 seasons' calvers for all the traits under study except for FLMY/FLL where monsoon calvers showed better performance. The lowest values for different production efficiency traits under study was obtained for summer calvers which may be due to unavailability of abundant green pastures during summer seasons and the environmental factors like temperature,

humidity *etc*. and animals may suffer from heat stress in early lactation when production and energy requirements were the highest.

Similarly non-significant effect of season was reported by Dhaka *et al.* (2002) in Hariana cattle & Chakraborty *et al.* (2010) for different traits in Murrah buffaloes and FLMY/FLL & MCI for Red Sindhi x Jersey crossbred cows (Verma and Thakur, 2013). On contrary, significant effects of season were reported by Japheth *et al.* (2015) in Karan Fries crossbred cattle; Sahiwal cattle by Singh and Singh (2016) and Verma *et al.* (2016) in Hardhenu crossbred cattle for FLMY/FLL & MCI.

Effect of genetic groups

Genetic groups had non-significant effects on production efficiency traits of Frieswal cows (Table 2). Genetic group-G1 (HF: 62.5-100%) was better for all the production efficiency traits of Frieswal cows than other genetic groups of cows. Similarly, non-significant effect of genetic groups was reported in Red Sindhi x Jersey crossbred cows for FLMY/FLL & MCI (Verma and Thakur, 2013).

CONCLUSION

The study indicates that period has proved to be significantly influencing most of the production efficiency traits of Frieswal cattle. Season and genetic groups have no significant effect on production efficiency traits of Frieswal cattle. Low CV for all the production efficiency traits indicate that low variability among the population and which can be improved by importing the proven Frieswal sires' semen from other herd to reduce the rate of inbreeding and enhancing the production. The production efficiency performances of Frieswal cows can also be improved by improving the managemental practices and proper feeding of animal in adverse climatic conditions.

RECOMMENDATION

Therefore, production efficiency traits can be utilized for the selection of Frieswal cattle for both production and reproduction potential and profitability.

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