“GENETIC EVALUATION OF REPRODUCTIVE TRAITS IN RELATION TO PRODUCTION TRAITS IN ORGANIZED HERD HOLSTEIN FRISIAN IN INDIA”

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ABSTRACT

The motive of this study to more information of genetic information (like heritability, genetic correlation) of HF imported sires germ plasma and Indian HF sires germ plasma used in India. Data was collected from an organized HF dairy farm Bhagylaxmi Dairy farm Manchar Pune recorded year from 2007 to 2014. Estimated heritability (h^2) for FLTMY, FL300/305DMY, Age of first calving, First lactation length, First dry period, First calving interval were 0.24 ± 0.08 , 0.32 ± 0.09 , 0.2 ± 0.79 , 0.13 ± 0.06 , 0.10 ± 0.06 , 0.19 ± 0.076 respectively. Genetic correlation of FLTMY with FL300/305DMY, FCI, FDP, FLL were found to be strongly positive 0.91, 0.70, 0.5, and 0.78, respectively. Whereas, genetic correlation of FLTMY with AFC was observed to be weakly positive 0.14. Genetic correlation of FL300/305DMY with FLL, AFC found to be strongly positive 0.60, 0.76, respectively and genetic correlation of FL300/305DMY with FDP, FCI was observed positively weak 0.20, 0.35, respectively. Genetic correlation between FCI and FDP, LL, was found to be strongly positive 0.68, 0.88 respectively. Genetic correlation between FCI and AFC was found to be medium positive 0.40. Genetic correlation between FLL and FDP was observed be weakly positive 0.13. Whenever, genetic correlation between FLL and AFC was found to be weakly negative -0.13. The heritability for production and reproduction were found to be low in this study. This means production and reproduction traits affected by the environment. Genetic correlation between two traits was observed to be highly positive or highly negative. It indicates that traits are influence by same gene.

Keywords-: Heritability, Holstein-Frisian, Genetic Correlation, Phenotypic Correlation.

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INTRODUCTION

To Genetically superior dairy herd first need to knowledge of genetic and phenotypic parameter is required for breeding policy to improvement herd according to objective. Heritability is very important genetic parameter which is relationship between genotypic and phenotypic value of individuals. In multivariate quantitative genetic, genetic correlation is the proportion of variance that two traits share due to genetic influence, phenotypic correlation is the proportion of variance that two traits share due to genetic and environmental influence. These genetic parameters are very important tool for deciding, designing and making breeding policy accordingly.

In India various workers estimate of heritability and correlation between economical traits in different breed of dairy cattle. Pol *et al.* (2013), Shelke(2012) were studies on Phule Triveni. Nehra(2011) and Singh (2013) reported on Karan Fries crossbred cattle, whereas Mukherjee(2005) study focused on Frieswal crossbred.

Materials and Methods

Data were collected from Bhagylaxmi dairy farm Manchar Pune, Maharashtra, India. Data was maintained by animal software (Dairy plan). Present study was conducted on 973 dams and 42 sires.

Paternal half sib correlation method (Becker, 1975) will be used to estimate h^2 of first lactation traits using the following model:

$$Y_{ij} = \mu + S_i + e_{ij}$$

where,

Y_{ij} = Observation on j^{th} progeny of i^{th} sire

μ = Overall mean

S_i = Effect of i^{th} sire

e_{ij} = Random error NID $(0, \sigma_e^2)$

The S_i and e_{ij} are assumed to be independent of each other.

Analysis of Variance

Sources of Variation	df	Mean Squares	Expected Mean Squares
Between sires	S-1	MSS_s	$\sigma_e^2 + K\sigma_s^2$
Within sires	N-S	MSS_E	σ_e^2

Where,

σ_e^2 : mean sum of square due to error

σ_s^2 : sire component of variance

K : average number of progenies per sire

$$t = \frac{\sigma_s^2}{\sigma_e^2 + \sigma_s^2}$$

$$h^2 = 4t$$

Becker (1975) gave genetic and phenotypic correlation among traits was estimated from the analysis of variance and covariance among sire groups.

Genetic correlation (r_g)

The genetic correlation between two traits was estimated as:

$$r_g(x,y) = \frac{\text{Covs}(x,y)}{\sqrt{\sigma_s^2(x) \cdot \sigma_s^2(y)}}$$

where,

Cov_s : sire components of covariance between traits x and y

$\sigma^2_{s(x)}$: sire components of variance of trait x

$\sigma^2_{s(y)}$: sire component of variance of trait y

RESULT AND DISCUSSION

Heritability estimation of first lactation total milk yield (FLTMY) found to be 0.24 ± 0.08 . The value indicated that the heritability is medium for milk production and genetics played significant role in the performance of animal as far as milk production is concerned. The estimation of heritability was observed in this study were observed similar reports of first lactation total milk yield reported by various workers in different crossbred and Triple crossbred was 0.041 ± 0.020 in FJG, JFG and BFG (Kale *et al.*, 2001) to 0.43 ± 0.020 (Gawari, 1999), Karan Fries 0.18 to 0.24 (Misra and Joshi, 2004), HF x Gir. Heritability estimation of FL300/305DMY was reported 0.32 ± 0.09 . The estimate indicated that the heritability is medium for milk production and genetics played significant role in the performance of animal as far as milk production is concerned. Shelke (2012) the heritability estimated 0.47 ± 0.11 in Phule Triveni three cross whereas Mukherjee(2005) was observed 0.20 ± 0.04 .

Estimation of heritability for AFC found to be 0.193 ± 0.079 . The estimate indicated that the heritability lower for age of first calving. Therefore much emphasis needs to be placed on the selection of breeding animals. Due care needs to be given for genetic evaluation of high genetic worth of animals in the herd. Saha (2001) heritability of AFC was reported 0.17 ± 0.09 in KF. Singh (2013) and Divya (2012) heritability for age of first calving(AFC) was reported 0.55 ± 0.13 , 0.54 ± 0.16 respectively in KF. Heritability of first lactation length was found to be 0.127 ± 0.06 . The estimated indicated that the heritability is lower. Therefore much emphasis needs to be placed on the selection of breeding animals. Due care needs to be given for genetic evaluation of high genetic worth of animals in the herd. Gawari (1999) estimation of heritability for first lactation length was observed 0.47 ± 0.12 in crossbred cattle and Bhoite (1996) was observed 0.25 ± 0.16 in JG crossbred. Heritability of first calving interval was found to be 0.188 ± 0.076 . Estimation indicated that the heritability is low. Therefore much emphasis needs to be placed on the selection of breeding animals. Due care needs to be given for genetic evaluation of high genetic worth of animals in the herd. Mukherjee (2005) heritability of FCI reported 0.06 ± 0.03 in Frieswal. Saha (2001), Panja(1997), Singh(1995) were reported heritability 0.35 ± 0.10 , 0.02 ± 0.14 , 0.02 ± 0.8 respectively in KF. Heritability of first calving interval was found to be positive low 0.093 ± 0.061 days. The Heritability of first dry period is low hence less possibility for improvement in this trait thought selective breeding. Deshmukhet *al.*(2003) was observed the heritability for dry period in Holstein Frisian x Gir crossed was 0.20, Komatwaret.*al* (2009) was observed the heritability for dry period in HF x Sahiwal crossbred as 0.12 ± 0.040 .

Table 1: Estimation of Heritability, Genetic and Phenotypic Correlation for First Lactation Traits of HF Cattle

	FCI	FDP	FLL	FL300/305DMY	FLTMY	AFC
FCI	0.188±.076	0.686**	0.883*	0.354*	0.708*	0.4
FDP	0.537**	0.093±0.061	0.127*	0.199	0.498**	NA
FLL	0.641*	-0.62	0.127±0.06	0.589*	0.781**	-0.133
FL300/305DMY	0.122	-0.239	0.47	0.318±0.09	0.917**	0.76**
FLTMY	0.386*	-0.092	0.678	0.887	0.244±0.08	0.144
AFC	0.039	0.086	-0.002	0.136	0.122	0.193±0.079

** Significant(P<0.01) *significant (P<0.05)

Genetic correlation between FLTMY and FL300/305DMY was observed highly significant (0.91). It means there is positively strong correlation between FLTMY and FL300/305DMY. Genetic correlation between FLTMY and First lactation length (FLL) was observed highly significant (0.78). Genetic correlation between FLTMY and First dry Period (FDP) was observed highly significant (0.49). Genetic correlation between FLTMY and first calving Interval (FCI) was observed significant (0.70). Nikam (2010) were reported significant genetic correlation between FLTMY and FL300DMY (0.99) in Pule Triveni synthetic cow whereas Gawari (1999) reported positive and significant ($P \leq 0.01$) genetic correlation. Genetic correlation among FL300/305DMY with first calving interval (FCI) was reported significant (0.35). Genetic correlation among FL300/305DMY with First dry period (FDP) was reported non-significant (0.12). Genetic correlation among FL300/305DMY with first lactation length (FLL) was reported significant (0.59). Correlation between FL300/305DMY and calving interval and first lactation length was strongly positive whereas correlation between FL300/305DMY and first dry period is low and positive. Pol *et al.* (2013) was observed (-0.11) genetic correlation between FLL and FL300DMY in Phule Trivenitriple cross cattle whereas Nikam (2010) was observed significant (-0.786) genetic correlation between FLL and FL300DMY in Pule Triveni triple cross cattle. Genetic correlation between AFC and FCI was observed positive correlation non-significant 0.40. Genetic correlation between AFC and first lactation length (FLL) was reported negative correlation non-significant -0.133. Genetic correlation between AFC and FL300/305DMY was reported positive correlation significant 0.076. Genetic correlation between AFC and FLTMY was reported positive correlation non-significant 0.144. It indicates correlation AFC and FCI was strongly positive if you are selecting one trait second trait will be automatically improve in herd. In other hand genetic correlation between AFC and FLL was negative correlation it means selection of one trait automatically rejection of second which is negatively correlated. Singh *et al.* (2005) was reported genetic correlations between AFC with FLTMY and FL300DMY which were positive and significant in crossbred cattle. Genetic correlation between FLL and FCI was reported highly positive correlation significant 0.88. Genetic correlation between FLL and FDP was observed low positive correlation significant 0.127. Genetic correlation between FDP and FCI was found to be highly positive correlation significant 0.686. It indicated that if we want reduce dry period calving interval automatically reduce by selection in a herd.

CONCLUSIONS

Heritability is one of the most important genetic parameter for animal breeding. There are h^2 for production and reproduction traits were observed moderately (from 0.15 to about 0.40) and low h^2 (less than 0.15). The heritability of a trait is not deciding factor in whether to include genetic improvement program as the economic values even low heritability traits improved by changed by selection. Accuracy of selection of low h^2 traits can be improved use of pedigree information and increased progeny group size.

Genetic correlation between two traits was found to be high and positive or high negative. It indicates that traits are influence by same gene.

REFERENCES

1. Becker, W.A. (1986). *Manual of procedures in quantitative genetics*. Publication of Washington, State Univ.
2. Pullman, USA
3. Bhoite, U. Y. and Kale, K.M. (1996) *Production performance of three breed Gir crosses*. Indian Vet.
4. J.73 (4): 473-474.

5. Deshmukh, D.S., Sakhare, P.G., Baig, M.I. and Dhaware, S.A. (2003). Studies on reproductive traits in
6. Holstein Friesian and Gir crossbred cows. *J. Bombay Veterinary College*, 11(1/2): 64-66.
7. Divya P (2012). Single versus multi-trait models for genetic evaluation of fertility traits in Karan Fries
8. cattle, M.V.Sc. Thesis submitted to NDRI, Karnal.
9. Gawari, R. G. (1999). Genetic studies on persistency of milk yield in triple crossbred cattle. M.Sc. (Agri.)
10. Thesis submitted to MPKV.,Rahuri.
11. Kale, D.D., Ulmek, B.R., Deokar, D.K. and Pachpute, S.T. (2001). Studies on lactation milk yield in triple
12. crossbred cattle. *J. Maharashtra Agri. Univ.* **26**(3): 316-319
13. Komatwar, S. J., Deshpande, A.D., Kulkarni, M. D., Kulkarni, A. P., Yadav, G. B., Shisode, M. G and
14. Khanvilkar, A. V. (2009). Study of genotypic and phenotypic correlations on production traits in
15. HolsteinFriesian x Sahiwal crossbreds *J Bombay. Vet. College*, 17 (1): 70-71.
16. Mukherjee, S. (2005). Genetic evaluation of Frieswal cattle Ph.D. Thesis, National Dairy Research Institute
17. Karnal, (India).
18. Misra, S. and Joshi, B.K. (2004).Genetic and non-genetic factors affecting lactation milk constituents
19. and yield traits in Karan Fries cattle. *Indian J. Dairy Sci.*, **57** (1):69-72.
20. Nehra, M. (2011) Genetic analysis of performance trends in Karan Fries cattle. M.V.Sc. Thesis. NDRI
21. Karnal, India.
22. Nikam, R. A. (2010). Effect of age and weight at first calving on reproduction and production performance of
- PhuleTriveni synthetic cow. M.Sc. (Agri.) Thesis submitted to MPKV, Rahuri.
23. Panja,Research Institute (Deemed University), Karnal, India.
24. P. (1997). Optimization of economic traits in Karan Fries cattle. M.Sc. Thesis,NDRIKarnal.
25. Pol, K. E., Dhage, S. A., Pachpute, S. T. and Khutal, B. B.(2013). Generation wise production
26. efficiency of PhuleTriveni synthetic cow. *J. Agric. Res. Technol.*, **38** (1): 117- 129.
27. Saha, D.N. and Khan, F.H.(1980). Lactation length in Gir cows. *Indian J. Dairy Sci.*, **18**(1):2224.
28. Shelke M. G.(2012). Generation wise persistency of milk production in PhuleTriveni Synthetic cows M.Sc.
29. (Agri.) Thesis submitted to MPKV, Rahuri
30. Singh R. K. (2013). Genetic evaluation of Karan Fries sires using multiple trait models. Ph.D. thesis
31. submitted to NDRI, Karnal (Haryana).
32. Singh, V. K., Singh, C.V., Kumar, D. and Kumar, A. (2005). Genetic evaluation of some economic traits
33. inSahiwal and its crossbreds. *Indian J. Dairy Sci.*, **58** (3): 206
34. Singh, M.K. (1995). Factors affecting trend in performance of Karan Swiss and Karan. Fries cattle. Ph.D.
35. Thesis, NDRI (Deemed University) Karnal, India.

36. Koots, K.R., J.P. Gibson, C. Smith and J.W. Wilton, (1994). Analyses of published genetic parameter
37. Estimates for beef production traits. 1. Heritability. *Anim. Breed. Abstr.*, 62: 309-338.