

## Path Analysis of Calving Interval in Phule Triveni Cattle

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**Abstract:** The present investigation was undertaken on the basis of records of Phule Triveni (50% HF + 25% Jersey + 25% Gir) cows maintained at RCDP on Cattle, MPKV, Rahuri, M.S. (India) from 1977 to 2012. Least squares means of gestation period, service period, lactation length, dry period and calving interval were worked by considering the effects of season of calving, period of calving and lactation order. Wherever the effects were significant, the means were compared by DMR Test. The data were corrected for significant effects and used for correlation between reproductive and productive traits and path analysis. The overall least squares mean of LL, DP, GP, SP, and CI in Phule Triveni cows were  $339.50 \pm 7.24$ ,  $104.28 \pm 4.54$ ,  $284.03 \pm 3.03$ ,  $117.86 \pm 3.83$  and  $430.91 \pm 4.83$  days, respectively. The influence of season of calving on LL, DP, GP, SP and CI was non-significant. The influence of period of calving on LL, DP, SP and CI were significant. The variations due to order of lactation in LL, DP, GP and CI were non-significant, while it was significant on SP. The correlations of calving interval with lactation length, dry period and service period were highly significant and positive, while the correlations of calving interval with gestation period were significant and negative. The path analysis of calving interval by taking reproductive components revealed that service period. The maximum variability of the effect of gestation period was almost nil. By taking the productive components of calving interval, the dry period was found to have more effect than lactation length. The direct effects of service period, dry period, lactation length and gestation period were 0.793, 0.567, 0.288 and 0.001, respectively. The model explained nearly 29% variation based on the data of different cows. The magnitude of residual effects (0.7196) clearly indicated that environmental factors influenced calving interval to great extent and genetical factors considered for study had less influence on calving interval.

**Keywords:** Path analysis, phule triveni, cattle, calving interval.

### INTRODUCTION

There search work on different genetic and non-genetic factors affecting calving interval was studied by least squares analysis and showed significant and non significant effects of factors on calving interval. However, least squares analysis (Harvey, 1990) did not show casual association among the factors and direct and indirect contribution of these factors to calving interval. However, path coefficient analysis (Wright, 1921) proves help ful in partitioning the correlation coefficients into the measure of direct and indirect effect sofa set of independent variables (*i.e.* different factors) on dependent variable. If the correlation is

dueto direct effect it reflects true relationship and for improving calving intervalsuch factors should be taken into consideration, as the seare more important in breeding programme. The path coefficient method is used in animal breeding to estimate the coefficient of relationship and in breeding. Hence, the present investigation was planned to study "Path analysis of calving interval in Phule Triveni cattle" with the following objectives:

1. To study non-genetic factors affecting traits under study in Phule Triveni cattle.
2. To study causal association of factors affecting traits under Study.

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## MATERIAL AND METHODS

### Collection of Data

The data of Phule Triveni cows up to 9<sup>th</sup> generations maintained at Research Cum Development Project on Cattle, MPKV, Rahuri for a period of 36 years (1977 to 2012) were considered for the present investigation. The following observations were taken into consideration Season of calving, Period of calving, Lactation order, Lactation length (days), Dry period (days), Gestation period (days), Service period (days) and Calving interval (days)

### Statistical Analysis

In order to overcome non-orthogonality of data resulting from unequal and disproportionate subclass frequencies, the least-squares method as suggested by Harvey (1990) was used for analysis of data.

### Correlation

The correlation coefficients among the traits were estimated by following Snedecor and Cochran (1967)

### Path Coefficient Analysis

To establish a cause and effect relationship, the first step used was to partition the correlation coefficients into direct and indirect effects by path analysis as suggested by Wright (1921).

## RESULTS AND DISCUSSION

The overall least squares mean of LL, DP, GP, SP, and CI in Phule Triveni cows were  $339.50 \pm 7.24$ ,  $104.28 \pm 4.54$ ,  $284.03 \pm 3.03$ ,  $117.86 \pm 3.83$  and  $430.91 \pm 4.83$  days, respectively.

The correlations among different traits in Phule Triveni cows had been presented in following table

**Table 1**  
Correlation among different traits

	Lactation Length	Dry Period	Gestation Period	Service Period	Calving Interval
Lactation Length	1				
Dry Period	-0.069**	1			
Gestation Period	-0.011	-0.017	1		
Service Period	0.118**	0.224**	-0.019	1	
Calving Interval	0.271**	0.591**	-0.015	0.817**	1

\* = Table $\chi^2$  > 0.062, \*\* = Table $\chi^2$  > 0.081

The correlation of lactation length with dry period was, negative and highly significant (-0.069). Correlation of lactation length with gestation period was negative and non-significant (-0.011) and the correlation of lactation length with service period and calving interval were positive and highly significant (0.118 and 0.271). The correlations of dry period with lactation length was negative and highly significant (-0.069) while correlation of dry period with service period and calving interval were positive and highly significant (0.224 and 0.591).

The correlations of gestation period with dry period, service period, calving interval and lactation length were negative and non-significant. The correlation of service period with gestation period was negative and non-significant (-0.019). The correlation of service period with lactation length, dry period and calving interval were positive and highly significant (0.118, 0.224 and 0.817).

The correlation of calving interval with gestation period was negative and non-significant (-0.015). Correlation of calving interval with dry period, lactation length and service period were positive and highly significant (0.591, 0.271 and 0.817 respectively).

**Table 2**  
Direct and indirect effect of traits towards calving interval

	Lactation Length	Dry Period	Gestation Period	Service Period	Calving Interval
Lactation Length	0.288	-0.039	0.000	0.023	0.271
Dry Period	-0.020	0.567	0.000	0.043	0.591
Gestation Period	-0.003	-0.010	0.001	-0.003	-0.015
Service Period	0.011	0.013	0.000	0.793	0.817
Residual effect	0.719665				

The lactation length had positive and direct effect on calving interval. It had positive effect with calving interval in each lactation length and total effect of independent traits on calving interval was 0.271 in that lactation length contribute major effect was about 0.288, while other factors *viz.* dry period, gestation period and service period contribute -0.020, -0.003 and 0.011, respectively.

The dry period had positive and direct effect on calving interval. It had positive effect with calving interval in each dry period and total effect of independent traits on calving interval was 0.591 in that, dry period contribute major effect was about 0.567, while other factors *viz.* lactation length, gestation period and service period contribute -0.039, -0.001 and 0.13, respectively, which has relatively small effect and effect of lactation length and gestation period were negative.

The gestation period had negative and direct effect on calving interval. It had negative effect with calving interval in each gestation period and total effect of independent traits on calving interval is -0.015 in that gestation period contribute major effect is about 0.001, while other factors *viz.* lactation length, dry period and service period had no effect.

The service period had positive and direct effect on calving interval. It had positive effect with calving interval in each service period and total effect of independent traits on calving interval is 0.817 in that service period contribute major effect is about 0.793, while other factors *viz.* lactation length, dry period, and gestation period contribute 0.023, 0.043 and -0.003, respectively, which has relatively small effect, in that gestation period shows negative effect.

The residual effect determines how best the causal factors account for variability of dependent factors, the trait in this case. It was observed the residual effect for different traits was 0.719. Similar value was reported by Baniket *et al.* (2003) in Murrah buffaloes. In present study the result indicated that nearly 29 percent of variation was explained by this model in different traits. The magnitude of the residual effects clearly indicated that the genetical contribution of factors considered in the present study, influence the calving interval to a less extent and the contribution in variation of calving interval through other genetical factors which were not considered for present study and environmental factors have more influence on the calving interval. D'Souza *et al.* (1995) also found effect of genetic and environmental factors on calving intervals in Gir cows. Kundu S. *et al.* (2003) studied on non-genetic factors affecting some reproductive traits in Murrah buffaloes.

### Path Analysis

It gives an effective measure of dividing direct and indirect cause of association and permits a critical examination of specific forces acting to produce a given correlation and measures the relative importance of each causal factor. A correlation simply measures mutual association without regard to causation, whereas the path coefficient analysis specifies the causes and measures their relative importance. Similar studies were carried out by Banik S. and Tomar S.S. (2003) in Murrah buffaloes.

Where,  $Y$  = Calving Interval (CI)

Productive components

$X_1$  = Lactation Lenth (LL)

$X_2$  = Dry Period (DP)

Reproductive components

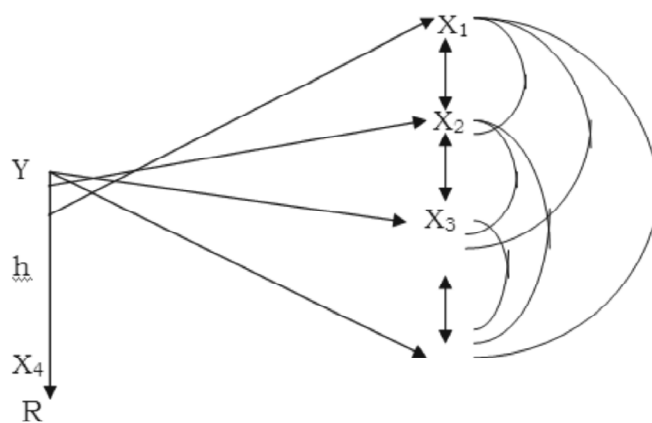
$X_3$  = Gestation Period (SP)

$X_4$  = Service Period (GP)

The results of path analysis of calving interval indicated that the effect of service period on calving interval was 0.817 it was relatively more than other traits, direct effect of dry period on calving interval was 0.567, followed by effect of lactation length on calving interval which was 0.288, whereas direct effect of gestation period was 0.001 which showed negligible effect on calving interval.

### CONCLUSIONS

The present investigation was concluded that in PhuleTriveni cows the effect of period of calving was significant in lactation length, dry period, service period and calving interval, while



Path Diagram

non-significant in gestation period. The variation due to season of calving and lactation order was non-significant in lactation length, gestation period service period, dry period and calving interval. While in service period effect of lactation order was significant. The correlation of calving interval with lactation length, dry period and service period were highly significant and positively correlated while with gestation period had non-significant effect.

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