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EFFECT OF LEVEL OF MILK ON SOME FERTILITY TRAITS IN SAHIWAL CATTLE

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Data on Sahiwal cows kept at the Livestock Production Research Institute, Bahadurnagar, Okara during the period 1963-87 were utilized for this study. The 305-day milk yield based on 2030 lactation records averaged 1670.45 ± 12.71 kg with a C.V. of 34.51%. The postpartum oestrus interval and service period averaged 130.40 ± 2.88 days and 146.40 ± 2.03 days, respectively and number of services per conception were 2.10 ± 0.04. The correlation and regression coefficients between level of milk production and postpartum oestrus interval, service period and services per conception were 0.017 and 0.003 ± 0.005, 0.044 and 0.008 ± 0.004 and 0.000 ± 0.000, respectively. The correlation and regression coefficients between level of milk production and service period were non-significant while the correlation and regression coefficients between level of milk production and number of services per conception were significant ($P<0.01$).

INTRODUCTION

Reproductive efficiency is one of the most important factors determining the success of a dairy farm. Some of the measures of the reproductive efficiency are known to be wholly environmental while others are determined by the heredity and environment both. The environmental factors include their nutritional status, management, disease control especially of the reproductive tract, quality of semen used and time of insemination (Maurer and Chenault, 1983). Similarly, the biological factors such as age of the cow and level of production could be important in influencing the fertility parameters. The parameters of reproductive performance include, age at maturity, age at first calving, postpartum oestrus interval, service period and calving interval, etc. For better return, it is essential to improve the fertility parameters so that the productive life as well as calf crop could be increased. This study was planned to determine the effect of level of production on some fertility parameters such as postpartum oestrus interval, service period and number of services per conception in Sahiwal cows.

MATERIALS AND METHODS

The pedigree and performance records of a purebred Sahiwal herd maintained at the Livestock Production Research Institute, Bahadurnagar, district Okara, Pakistan during the period 1963-87 were utilized for this study. Only the normal and complete records of the cows were included in this study. Incomplete lactations of less than 180 days and the cows having less than 6 complete lactation records were excluded from the study. The lactation was considered abnormal if it followed a stillbirth, abortion or a premature birth. The data on the following traits were tabulated from the history sheets of the cows for statistical analysis:

i. Number of services per conception
ii. Postpartum oestrus interval
iii. Service period at each conception
iv. 305-day milk yield in each lactation

The fertility parameters such as postpartum oestrus interval, service period, and number of services per conception were classified according to the level of production into six groups i.e. ≤1000, 1001-1500, 1501-2000, 2001-2500, 2501-3000 and >3000 kg of milk per lactation. The regression coefficients of postpartum oestrus interval (Y_1), service period (Y_2) and the number of services per conception (Y_3) (dependent variables) on level of production (X_1) (independent variable) were worked out. The standard error of the regression coefficient was also worked out by the following formula:

$$\text{Standard error } (S_b) = \frac{\Sigma y^2 - \frac{b \Sigma xy}{n-2}}{\Sigma x^2}$$

where

Sb = Standard error of regression,
b = Regression coefficient,
n = Number of observations,
Σy^2 = Corrected sum of squares for the dependent variables,
Σx^2 = Corrected sum of squares for the independent variables, and
Σxy = Corrected sum of cross-products

RESULTS AND DISCUSSION

Mean values for various performance traits from the data of 311 Sahiwal cows who had at least six complete breeding records are given in Table 1.

Postpartum oestrus interval: Mean values for postpartum oestrus interval, service period and number of services per conception as per class interval of level of milk production are given in Table 2. Mean postpartum oestrus interval in cows yielding less than 1000 kg of milk per lactation was 133.2 days. It showed decreasing trend with increased level of milk yield and postpartum oestrus interval averaged 126.1 days in cows yielding 1501-2000 kg milk per lactation. Thereafter, it increased with increasing level of milk production and the average postpartum oestrus interval was 170 days in cows producing more than 3000 kg of milk in a lactation period of 305 days. The correlation coefficient between milk yield and postpartum oestrus interval was 0.017 (Table 3). This relationship was, however, non-significant. The regression of postpartum oestrus interval on milk yield was also non-significant (Table 4). The postpartum oestrus increased by 0.003 ± 0.005 days for each kg increase in

Table 1. Mean values and coefficients of variation of various performance traits

Traits	Number of observations	Mean ± S.E.	Range	C.V. (%)
Milk yield (kg)	2030	1670.43 ± 12.71	451.0 - 4172.0	34.51
Postpartum oestrus interval (days)	1098	130.40 ± 2.88	14.0 - 658.0	68.82
Service period (days)	1982	146.40 ± 2.03	22.0 - 658.0	61.80
Services per conception	1982	2.10 ± 0.04	1.0 - 11.0	78.25

milk yield. The prediction equation for estimating postpartum oestrus interval from milk yield is also given in Table 4.

al. (1985) reported that the effect of level of milk production on postpartum oestrus did not differ significantly.

Table 2. Means for some fertility parameters as per class interval of level of milk production

Level of milk production (kg)	Postpartum oestrus interval (days)		Service period (days)		No. of services per conception	
	n	Mean	n	Mean	n	Mean
<1000	104	133.2	192	135.10	193	1.99
1001-1500	353	131.5	588	132.35	617	1.90
1501-2000	432	126.1	759	140.60	782	2.16
2001-2500	127	129.2	246	144.50	247	2.34
2501-3000	61	138.7	116	153.34	115	2.23
>3000	21	170.0	38	169.90	37	2.35

Table 3. Correlation coefficients between level of milk production and various fertility parameters

Traits correlated	Correlation coefficients
Milk yield and postpartum oestrus interval	0.017^{NS}
Milk yield and service period	0.044^{NS}
Milk yield and number of services per conception	0.104**

** Significant at 1% level of probability.

The results of this study are confirmed by the findings of Fonseca (1980) and Bhalaru *et al.* (1985). Fonseca (1980) reported that milk yield had only small effect on postpartum oestrus interval. Bhalaru *et*

Service period: The average service period in cows yielding less than 1000 kg of milk was 135.10 days and it averaged 169.90 days for cows yielding over 3000 kg of milk per lactation of 305 days. An overall increasing trend in the service period with increased levels of milk production was obvious from the data presented in Table 2. This relationship was, however, non-significant (0.044). The regression of service period on the level of milk production was also non-significant. The service period increased by 0.008 ± 0.004 days for each kg increase in milk yield (Table 4). The prediction equation to estimate service period from milk yield was:

$$Y_i = 132.67 \pm 0.008\ X_i$$

where

Y_i = is the estimated service period in days, and

X_i = is the milk yield in kg.

Table 4. Regression coefficients of various fertility parameters due to the level of milk production

Traits regressed	regression coefficients	Regression equations
Postpartum oestrus interval (days)	0.003 ± 0.005NS (1063)	Yi = 131.62 ± 0.003 Xi
Service period (days)	0.008 ± 0.004 NS (1793)	Yi = 132.67 ± 0.008 Xi
Number of services per conception	0.000 ± 0.000** (1793)	Yi = 1.44 ± 0.000 Xi

NS = Non-significant; ** = Significant (P<0.01).
The figures in parentheses indicate the number of observations.

The results of this study are substantiated by the findings of Kale *et al.* (1984) and Vasovic *et al.* (1987). They found that correlation of milk yield with service period was non-significant.

Number of services per conception: Average number of services per conception was 1.99 for cows producing less than 1000 kg of milk per lactation and 2.35 for cows yielding more than 3000 kg of milk per lactation. The correlation coefficients between level of milk yield and number of services per conception was 0.104 which was significant (Table 3). The regression on number of services per conception on milk yield was zero (0.000) which indicated that for each 100 kg increase in milk yield, the number of services per conception will not be increased. This increase in the number of services per conception was found to be significant.

The results of this study are in close agreement with those of Fisher *et al.* (1983) who analysed the data recorded on 400 Holstein-Friesian heifers and found that the number of services per conception tended to increase with milk yield. Krylova and Shcheglov (1986) and Vasovic *et al.* (1987) also found that the correlations of milk yield with the number of inseminations per conception were significant.

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