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REPEATABILITY OF MILK YIELD AND EFFECT OF AGE AT FIRST CALVING AND CALVING INTERVAL ON MILK YIELD IN A SAHIWAL HERD

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The experimental data for this investigation were collected from the production records of Sahiwal cows from 1948 to 1957. The overall average lactation milk yield was 1631.9±79.0 kg. and the average calving interval was 455.7±14.7 days. The repeatability of lactation milk yield was 0.317±0.881 which appears to be low and indicates that reliability of predicting future performance on the basis of first lactation record is not advisable. The correlation and regression between age at first calving and first lactation milk yield were −0.038 and −0.0725, respectively. The correlation and regression coefficients between age at first calving and total milk yield of first 4 lactations were −0.417 and −4.526 and between average calving interval and average lactation milk yield were 0.603 ($P<0.01$) and 3.325, respectively.

INTRODUCTION

The cows and the buffaloes are the main source of milk supply throughout the world. In Pakistan cows produce about 30.9 per cent of the total milk (7725 million kg.) produced annually (Haq and Masud 1966).

Milk production is influenced by the environmental factors, such as climate, management, nutrition and diseases etc., in addition to the genetic potential of the individual. The basic factor in achieving longer production life is reproductive efficiency. The age at first calving is also important in considering the total life time production, longer calving interval increases the length of lactation and dry period, consequently lowers the average daily yield thereby reducing the life time milk production of individual. It is therefore evident that reduction in age at first calving and in the calving interval by reducing the service period are important factors to increase the number of lactations during the productive life of the animal.

Repeatability is the correlation between repeated records of the same individual for a particular trait. It helps in predicting the most probable

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producing ability (M.P.P.A.) and making effective breeding plans for the future improvement of the dairy animals.

The present research has been designed to estimate the repeatability of milk yield as well as to estimate the influence of age at first calving and calving interval on milk yield in Sahiwal cows. The knowledge of these factors is essential for undertaking any steps for the improvement of production performance of dairy cows.

MATERIALS AND METHODS

Production records of Sahiwal cows kept at Government Dairy Farm Montgomery (now Sahiwal) from 1948 to 1957 were used for the collection of this experimental data. The records were available on age at calving, lactation days, calving interval and lactation milk yield. The lactations of more than 119 days were included in this study.

For the estimation of repeatability, the cows which had at least two lactation records were included. Forty such cows with 153 lactations were available for the purpose. All the lactation records used to estimate the repeatability were standardized on 305 days mature equivalent basis by using the correction factors calculated by Ahmad and Ahmad (1972). To estimate repeatability of lactation milk yield the data were subjected to the analysis of variance (Becker, 1967) and then the repeatability was estimated as an intraclass correlation.

Only 57 cows were available with age at first calving and were used to estimate the relationship of age at first calving on milk production. To estimate the relationship of age at first calving and calving interval with milk yield, correlation and regression coefficients between the following variables were computed and tested for significance (Snedecor and Cochran 1967).

(a) Correlation coefficient of age at first calving with first lactation milk yield.

(b) Correlation coefficient and regression coefficient between lactations.

(c) Average calving interval and its correlation coefficient with average milk yield.

RESULTS AND DISCUSSION

(a) *Repeatability of Lactation Milk Yield*

Repeatability estimate for the lactation milk yield was obtained as interclass correlation among records which were expressed several times during

the life of a cow. Table 1, presents the analysis of variance of lactation milk yields for between cows and between records within cows.

Table 1. *Analysis of variance of milk yield for between cows differences during various lactations.*

Source of variation	Degrees of Freedom	Mean Squares	Expected Mean Squares
Between Cows	39	388052	$\delta^2 e + 3.293\ 0s2$
Within Cows	113	314905	$\delta^2 e$

The estimate of repeatability of milk yield obtained (0.317±0.88) is in close agreement with the results reported by many workers (Petuhov, 1969; Ahmad and Ahmad, 1972). Still many other authors have reported higher estimate of repeatability (Iljinakil, 1970 Qureshi, 1974) which indicate that milk production is greatly influenced by the temporary environmental conditions.

(b) *Lactation Milk Yield*

The records of lactation milk yield and lactation length were classified according to the lactation number and are presented here in the Table 2.

Table 2. *Average lactation milk yield and length for various lactations.*

Lactation number	No. of records	Average length of lactation (days)	Average milk yield (kg)
1	57	313	1562
2	45	276	1655
3	31	270	1707
4	25	259	1621
5	15	247	1448
6	14	253	1467
7	7	234	1187

There is a wide range of variation in average milk yield of Sahiwal cows as reported by different authors (Kushwaha and Misra, 1969 Ahmad and Ahmad, 1972 and Qureshi, 1970). These differences would arise between herds of the same breed because of different managemental and nutritional conditions.

Effect of Age at First Calving on Milk Yield

(i) Relationship between age at first calving and first lactation milk yield. The average age of cows at various lactations is given in Table 3.

Table 3. *Average age and calving interval of cows at various calvings.*

Lactation number	Average age at calving (days)	Lactation number	Average calving interval (days)
1	1534	2	512
2	2071	3	439
3	2501	4	433
4	2815	5	406
5	3089	6	459
6	3434	7	415
7	3637		

The results with regard to the correlation of age at first calving and first lactation milk yield (–0.038) are in accordance with the results reported by many workers. However the present results differed from those represented by some others who got significant correlation between these traits (Kushawaha and Misra, 1969).

(ii) *Relationship between age at first calving and total milk yield of first four lactations.* The correlation coefficient between age at first calving and total milk yield of first four lactations was estimated, and was found to be 0.417. Similar results were obtained by Hussain (1966). However, no research report is known to have been made on the correlation between age at first calving and the total milk yield of first four lactations. The regression coefficient between these two traits was estimated to be –4.526.

Effect of Calving Interval on Milk Yield

The average calving intervals for various lactations are presented in Table 3. The overall calving interval for the cows was 455.7 ± 14.7 days, and overall lactation milk yield was 1561.8 ± 73.1 kg. The correlation coefficient between these two traits was estimated to be 0.60 ($P<0.01$). The regression coefficient was 3.235. Similar results were reported by many other workers (Juszczak *et al.*, 1969).

Age Correction Factors

Table 4 gives ratio factors for the correction of lactation milk yield for age of the cow in term, of lactation number.

Table 4. *Ratio factors to correct milk yield for lactation number.*

Lactation number	Average milk yield (kg.)	Correction factors
1	1562	1.0909
2.	1655	1.0296
3	1707	1.0000
4	1621	1.0512
5	1448	1.1482
6	1467	1.1616
7	1187	1.4356

However, these correction factors are based on a small number of records, and therefor cannot be recommended for use in other Sahiwal herds as a general routine.

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