THE ASSOCIATIONS BETWEEN CALVING INTERVAL, DAYS DRY AND LACTATION YEILDS OF FRIESIANS

LA ASSOCIACÍON ENTRE INTERVALO DE PARTURICIÓN, DÍAS SECOS Y RENDIMENTO LACTATIVO DE LAS FRIESIANS

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Hammond and Sanders (1923) noted that pregnancy appeared to depress milk production starting at the 20th week of gestation; this effect becomes increasingly important as the lactation continues. The impact of pregnancy is particularly important on natural (total) lactation yields but as shown by Auran (1974) 305-day lactations are also affected by variation in length of current calving interval. Schaeffer and Henderson (1972) calculated adjustment factors required to eliminate the effect of open period on the current lactation. Since open period and current calving interval are highly correlated, the adjustment factors for open period should be almost identical to those for calving interval.

Schaeffer, Everett and Henderson (1973) showed that adjustment of records for days open caused some reranking of dairy sires but found no evidence of any genetic relationship between milk production and length of open period. A study of a small sample of U.K. data (MMB, 1976) also indicated that high yielding cows did not necessarily have more difficulties in conceiving.

Olds, Cooper and Thrift (1979) calculated that for every additional day open, *annual* milk production would be reduced by 4.5kg in the case of heifers, and by 8.6kg in later lactations. *Total* production per lactation increased by about 10kg for every additional day open.

Material and Method

Yield of milk and butterfat records from registered British Friesians were adjusted for age and month of calving and each record was expressed as a percentage deviation from the adjusted heifer herd-year average. Calving intervals and dry periods were expressed as deviations from the respective averages of all cows in that herd-year.

Phenotypic parameters were obtained using about 24,000 records and heritabilities and genetic correlations between yield traits were based on about 20,000 daughter-dam pairs. Heritabilities and correlations between dry period and calving interval were based on about 6,000 daughter-dam pairs.

A reduced data set was also analysed in which cows whose calving interval deviation was not within the range ± 80 days were rejected.

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FIGURE 1

Quadratic phenotypic regressions of butterfat yield on interval between first and second calving.

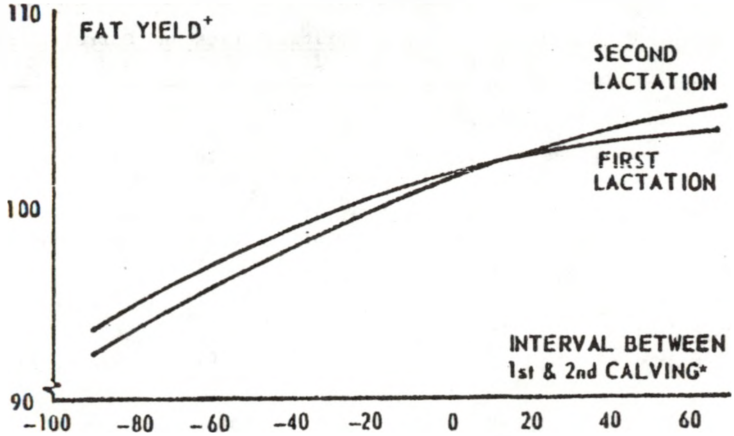
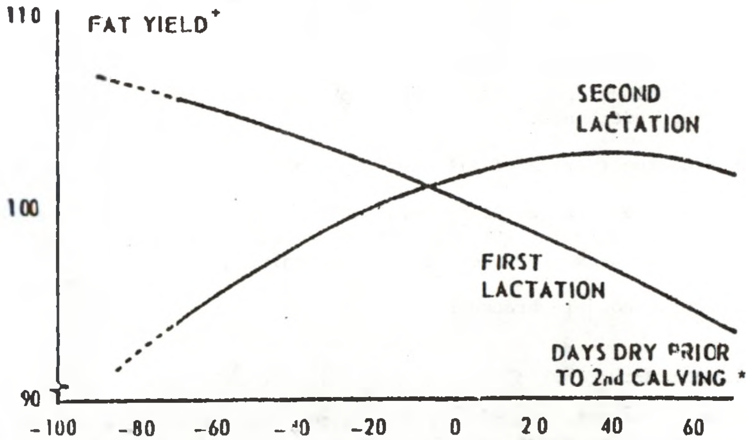


FIGURE 2

Quadratic phenotypic regressions of butterfat yield on length of dry period prior to second lactation.



+ * See footnotes for Table 1 for exact definition.

TABLE 1: Means, Standard Deviations, genetic and phenotypic parameters for Dry Period prior to 2nd calving, interval between first and second calvings, and first lactation milk and butterfat yields.

Trait	Mean	SD	Heritabilities and Correlations[ϕ] 1	2	3	4
ALL RECORDS INCLUDED						
(1) Dry period prior to 2nd lactation deviation*	-6.7	24.2	$\underline{0.10}$ (0.02)[∝]	+0.16 (0.20)	+0.33 (0.05)	+0.38 (0.05)
(2) Interval between 1st and 2nd calving deviation*	-2.2	39.2	+0.41 (0.01)	$\underline{0.05}$ (0.02)	-0.20 (0.05)	-0.24 (0.05)
(3) Age adjusted milk yield deviation † 1st lactation	100.5	14.5	-0.11 (0.01)	-0.13 (0.01)	$\underline{0.34}$ (0.01)	+0.76 (0.02)
(4) Age adjusted butterfat yield deviation † 1st lactation	100.7	14.5	-0.11 (0.01)	+0.13 (0.01)	+0.83 (0.01)	$\underline{0.31}$ (0.01)
EXCLUDING CALVING INTERVALS > 80 DAYS OR < -80 DAYS						
(1) Dry period deviation*	-8.5	19.8	$\underline{0.15}$ (0.02)	+0.42 (0.10)	-0.25 (0.05)	-0.31 (0.04)
(2) Calving interval deviation*	-9.7	29.8	+0.36 (0.01)	$\underline{0.09}$ (0.02)	-0.01 (0.08)	-0.10 (0.08)
(3) Milk yield†	100.3	14.4	-0.14 (0.01)	-0.13 (0.01)	-	+0.77 (0.02)
(4) Butterfat yield†	100.7	14.6	-0.14 (0.01)	+0.12 (0.01)	+0.84 (0.01)	-

ϕ Genetic correlations above the diagonal, phenotypic below the diagonal and heritabilities underlined.

* Deviation from the average of all cows calving in the same year (days).

† Deviation from the average 305-day production of first lactation females, expressed as a percentage; 101 means 1% above herd-year average. All lactations pre-adjusted for age and month of calving.

∝ Standard errors shown in brackets.

Results and Discussion

Table 1 shows the genetic and phenotypic parameters obtained both including, and excluding those records which fell outside the range $\pm$ 80 days for calving interval deviation. This $\pm$ 80 day restriction removed 5% of the records and most of these had calving intervals which were greater than + 80 days relative to herd average; such records could be regarded as 'unusual'. The relationship between traits such as calving interval and milk yield are not perfectly linear (see Figures 1 and 2), so 'unusual' records could therefore have a large influence on linear parameter estimates.

It will be seen that the heritability of calving interval increased from 0.05 to 0.09 when the 'unusual' records were excluded, although this change was not significant at the 95% level. The phenotypic correlations between the traits were affected little by the removal of 'unusual' records. However, the genetic correlations did change significantly, especially those involving dry period and yield traits.

The relationships depicted in Figure 1 suggest that for the selection of bull dams, adjustment of records for current and preceding calving interval could be beneficial. However, adjustment of records for length of preceding calving interval would be inadvisable if preceding and current calving interval deviations for individual cows are correlated.

The use of milk records only to detect conception difficulties in high yielding cows is perhaps not possible because failure to conceive would only be expected where levels of nutrition were inadequate for the higher yielding cows. The limiting factor for such high yielding cows might be quantity of food or, more likely, energy density (or quantity) of supplementary concentrates. Analysis of milk records have generally failed to detect strong phenotypic associations between level of production before the 20th week of gestation and measures of female fertility. However, with low levels of feeding or low nutrient density rations, such associations might become apparent.

Whatever the association between production in early lactation, and fertility traits, there is a strong case for the use of current calving interval adjustment factors when estimating breeding values for 305-day yield.

SUMMARY

Genetic and Phenotypic Correlations were calculated between 305-day first lactation milk and butter yields, length of calving interval and length of dry period. All calculations were performed on a within herd-year basis and heritabilities calculated using daughter-dam regressions. An analysis was also performed on a reduced data-set from which 5% of the records were rejected because calving intervals were not within the range herd average plus 80 days to herd average minus 80 days. The removal of these unusual records caused the genetic correlation between milk yield and calving interval to change from -0.20 ± 0.05 to -0.01 ± 0.08; the heritability of calving interval also changed from 0.05 ± 0.02 to 0.09 ± 0.02. The genetic correlations between first lactation milk and dry period following the end of first lactation was +0.33 ± 0.05 and -0.25 ± 0.05 for the full and reduced data-sets respectively. Adjustment of 305-day records for current calving interval would improve the evaluation of cows to breed bulls.

ZUSAMMENFASSUNG

Genetische und phänotypische Korrelationen zwischen 305-Tage Mulch-und Fettleistung (1.Lakt.) Zwischenkalbezeit und Trockenzeit wurden berechnet. Alle Berechnungen waren innerhalb Herden, und Heritabilitäten wurden mit Töchter Mütter-Regressionen berechnet. Eine Analyse wurde an einem beschränkten Datenmaterial durchgeführt, bei dem 5% der Daten ausgeschieden waren, da die Zwischenkalbezeit nicht innerhalb plus and minus 80 Tage des Herdendurchschnitts lag. Die Ausscheidung dieser Daten verursachte eine Änderung der genetischen Korrelation zwischen Milchleistung und Zwischenkalbezeit von -0.20 ± 0.05 zu -0.01 ± 0.08; die Heritabilität der Zwischenkalbezeit änderte sich von 0.05 ± 0.02 zu 0.09 ± 0.02. Die genetische Korrelation zwischen Milchleistung (1.Lakt.)

und Trockenzeit nach der 1. Laktation war +-.33 ± 0.05 und -0.25 ± 0.05 für deas ganze und reduzierte Datenmaterial. Eine Korrektur der 305 Tage Milchleistung für die Zwischenkalbezeit würde die Zuchtwertschätzung der Kühe zur Nachzucht von Bullen verbessern.

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