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Study on Friesian Herds Raised in Egypt and Germany

I. Estimate of non-genetic effects and genetic parameters

Summary

Data on 2422 and 27756 Friesian cows in Egypt and Germany, respectively, were used to estimate genetic and non-genetic effects on initial milk yield in 70 days (IMY), 305-day milk yield (305-dMY), lactation period (LP) and calving interval (CI). Data were collected in the period from 1987 to 1992 in Egypt and from 1979 to 1993 in Germany. Least squares analysis shows the significant effect of season and year of calving and parity on all traits. Least squares analysis indicates that winter and spring calvers had the higher value in all traits studied than summer and autumn calvers of Friesian cows in Egypt, while in German Friesian cows, the autumn calvers had the higher value in all traits studied than summer and spring calvers. The results show that the milk yield increased with increased lactation orders. Partial linear and quadratic regression coefficients indicate that age at calving was negatively associated with CI, while it showed positive association with LP and 305-dMY in Friesian cows in Egypt, while in German Friesian cows age at calving was negatively associated with LP and CI, while associated positively with milk yield. Heritabilities were 0.24, 0.22, 0.14 and 0.16 for IMY, 305-dMY, LP and CI, respectively of Friesian cows in Egypt and were 0.34, 0.24, 0.08 and 0.09 for IMY, 305-dMY, LP and CI, respectively in German Friesian cows. All phenotypic and genetic correlations between different traits studied were positive and significant.

Key Words: Friesian cattle, Germany, Egypt, milk production, non-genetic effects, genetic parameters

Zusammenfassung

Titel der Arbeit: **Studien über Schwarzbunte Rinder in Ägypten und Deutschland. 1. Mitt.: Schätzung nicht genetischer und genetischer Parameter**

2422 schwarzbunte Kühe in Ägypten und 27756 in Deutschland wurden untersucht, um genetische und nicht genetische Einflußfaktoren auf die 70 Tage-Milchleistung (IMY), 305-Tage-Milchleistung (305-dMY), Laktationsdauer (LP) und Zwischenkalbezeit (CI) zu ermitteln. Die Erhebungen bezogen sich auf die Jahre 1987 bis 1992 in Ägypten und 1979 bis 1993 in Deutschland. Die Least Squares-Varianzanalyse zeigt signifikanten Einfluß der Saison, des Jahres und der Laktation auf alle untersuchten Kriterien. In Ägypten hatten die Tiere, die im Winter und Frühjahr abgekalbt haben, die höchste Milchleistung; in Deutschland war die Milchleistung für die Herbstabkalbung am höchsten und bei der Sommer- und Frühjahrabkalbungen am niedrigsten. Wie erwartet, war eine Steigerung der Milchleistung mit steigender Laktationsfolge festzustellen. Das Abkalbealter stand bei den Schwarzbunten in Ägypten in negativer Beziehung zur Zwischenkalbezeit und in positiver zur Laktationsdauer. Bei Schwarzbunten in Deutschland war eine positive Wirkung zur Zwischenkalbezeit und Laktationsdauer festzustellen. Bei beiden Standorten hatte ein späteres Abkalbealter eine positive Beziehung zur Milchleistung. Die Heritabilitätswerte waren 0,24, 0,22, 0,14 und 0,16 für IMY, 305-dMY, LP und CI in Ägypten und 0,34, 0,24, 0,08 und 0,09 für Deutschland. Die phänotypischen und genetischen Korrelationen zwischen den untersuchten Kriterien waren positiv und signifikant.

Schlüsselwörter: Schwarzbuntrind, Deutschland, Ägypten, Milchproduktion, nicht genetische Einflüsse, genetische Parameter

Introduction

In formulating a genetic index for use in sire and cow evaluation, there is need to account for non-genetic factors which influence an animal's performance. The performance traits are quantitative and reflect the combined effects of large numbers of genes. These traits are also significantly affected by environmental factors (i. e., month and year of calving and lactation orders), therefore, require adjustments for these non-genetic factors. Productive and reproductive traits are affected by these factors in various ratios according to tropical or mild area conditions. We analysed two sets of different data in Egypt and Germany to show these effects. Genetic and phenotypic changes in the performance traits of dairy cattle are the ultimate indicator of progress in a herd. Such a change is measured as genetic and phenotypic trend. The purpose of this study was to estimate (1) non-genetic factors affecting initial milk yield, 305-day milk yield, lactation period and calving interval for Friesian herds in Egypt and Germany, and (2) phenotypic and genetic parameters for different traits studied.

Materials and Methods

The data used in this study were obtained from the milk records of Friesian cows in two locations. The first location was Dalla farm, which is 130 kilometres from Cairo City, Egypt. The second location was Osnabrück in Germany where data were collected from different farms.

In Egypt, data covered a period of 6 years, from 1987 to 1992. A total of 2422 lactation records of cows producing for, at least, 100 days were used. Number of cows, sires and daughters per sire were 706, 308 and 7.73, respectively. On the basis of prevailing climatic conditions (Table 1), the year was classified into four seasons, winter (December-February), spring (March-May), summer (June-August) and autumn (September-November). Each lactation was identified by the parity of cow from 1 to 5. Each record included cow, sire, dam identification, birth date, calving date, age at calving, parity, year, initial milk yield, 305-day milk yield, lactation period, days dry, calving interval, days open and monthly milk yield (from first to tenth lactation month). Animals were kept loose in Egypt under semi-open sheds all the year round. Cows were fed on Alfa-Alfa and rice straw during the year with concentrate ration. Concentrates were offered twice daily before milking, about 4-5 kg, according to the animal's body weight and production. Cows were machine-milked twice a day (at 7 a.m. and 4 p.m.). Cows producing more than 10 kg a day and those in the last two

Table 1
Daily weather observations for different seasons in Egypt (Tägl. Klimawerte für die Jahreszeiten in Ägypten)

Season	Air temperature		Humidity %		Rain
	Max.	Min.	7:30 a.m.	13:30 p.m.	mm/d
Winter	20	8.5	73.16	49.53	0.833
Spring	24.3	9.8	71.03	45.97	0.233
Summer	30.8	18.3	74.67	33.53	0.000
Autumn	29.8	15.4	75.16	49.60	0.020

months of pregnancy were supplemented with extra concentrate rations. The nucleus of this herd was imported to Egypt from USA as pregnant heifers in 1986. Imported semen from the USA was used every year in artificial insemination (AI) at random. Heifers were served for the first time when they reached 24 months or 350 kg, therefore cows were usually served two months postpartum. Pregnancy was detected by rectal palpation 60 days after the last service.

In Germany, data were collected by VIT (Vereinigte Informationssysteme Tierhaltung, Verden) over a period of 15 years from 1979 to 1993. Number of records, cows, sires, and daughters per sire were 27756, 9069, 659 and 39.72, respectively. The season of calving was divided into 3 categories according to the month of calving and environmental conditions, i.e. winter season (December, January, February and March), summer season (April, May, June, July, August and September) and autumn season (October and November). Each record included the same division for Dalla farm data. Data originated from many farms in one sub-region in Osnabrück and were offered by VIT (Vereinigte Informationssysteme Tierhaltung, Verden). It was the original data which were used for the estimation of the breeding values for the Friesian breed (Schwarzbunt). The animals were fed in spring, summer and autumn concentrates according to the performance off the grassland. In the winter they were fed concentrates and conserved feed. Data were adjusted for herd-class before analysis.

Statistical Analysis

Data were analysed using Mixed Model Least Squares and the Maximum Likelihood Computer Program of HARVEY (1990). The following full mixed model was used:

$$Y_{ijklmn} = \mu + s_i + d_{ij} + M_k + Y_l + P_m + b_1(X_{1\,ijklmn} - \overline{X}_{1\,ijklm}) + b_2(X_{2\,ijklmn} - \overline{X}_{2\,ijklm}) + e_{ijklmn}.$$

Where: Y_{ijklmn} = the performance of observation; μ = the overall mean; s_i = the random effect of the i[th] sire; d_{ij} = the random effect of the j[th] cow nested within a random effect of the i[th] sire; M_k = the fixed effect of the k[th] season of calving; Y_l = the fixed effect of the l[th] year of calving; P_m = the fixed effect of the m[th] lactation order; b_1 and b_2 = the linear and quadratic regression coefficients, respectively of IMY or 305-dMY in kg or LP or CI in days on age at calving in months; $X_{1ijklmn}$ = the age of the cow at calving in months for the corresponding Y_{ijklm}; $\overline{X}_{1ijklm}$ = the mean of age at calving in months and e_{ijklmn} = a random error, which is assumed to be independent and normally distribution all the other effects not specified in the model.

Estimation of variance and covariance component depends mainly on Henderson's Method 3 (HARVEY, 1990). Accordingly, estimates of sire (σ^2_s) and remainder (σ^2_e) components of variances and covariances were obtained. The heritability (h^2) for each trait, genetic (r_g) and phenotypic (r_p) correlations between any two traits as well as their standard error were estimated using the formula described by HARVEY (1990).

Results and Discussion

Phenotypic means, standard deviation and coefficients of variation (CVs) for initial milk yield (IMY), 305-day milk yield (305-dMY), lactation period (LP) and calving interval (CI) for Friesian cows in Egypt and Germany in different parities are presented in (Table 2). In Egypt, the present means of IMY and 305-dMY were higher than those reported by KHATTAB and SULTAN (1990) on Friesian cows in Egypt, which were 756 and 2484 kg, respectively. Also, the actual mean of 305-dMY was higher than those reported by THORPE et al. (1994) in Kenya and AMIN et al. (1996) in Hungary on Friesian cows, being 2826 and 4525 kg, respectively. The present mean of milk yield is in close agreement to that observed by PTAK et al. (1993) on Holstein Friesian cows in Canada (4699 kg), is lower than that reported by BAFFOUR-AWUAH et al., (1996) with Holstein Friesian in England, being 6078 kg. The present actual mean of the lactation period (LP) is in agreement to that reported by MOHARRAM (1988) using another herd of Friesian cows in Egypt and being 299 days. Also, THORPE et al. (1994) used different dairy breeds in Kenya, ranging between 280 and 317 days. The mean of calving interval (CI) in the present study (379 days) is the same as reported by RAY et al. (1992) with Holstein Friesian cows in Arizona, being 379 days, and within the range of estimates (364 and 412 days) obtained by DJEMALI and BERGER (1992) on different dairy cattle breeds in Florida and THORPE et al. (1994) on different dairy cattle breeds in Kenya.

In German Friesian cows, the present actual mean of IMY is in very close agreement with this reported by BAFFOUR-AWUAH et al. (1996) on British Holstein Friesian cows, being 1545 kg. The actual mean of 305-dMY was higher than that reported by JAIRATH et al. (1995) with Holstein cows; AMIN et al., (1996) on Holstein Friesian cows and BAFFOUR-AWUAH et al. (1996) on British Holstein Friesian cows, ranging from 3845 to 6078 kg. This is lower than that reported by WADE and VANVLECK (1989) working on Holstein cows, who found that the mean of 305-dMY was 9046, 7874, and 7805 kg in California, New York and Wisconsin, respectively.

Table 2
Means, standard deviations (SD) and coefficients of variability (CV) of unadjusted records of traits, initial milk yield (IMY), 305-day milk yield (305-dMY), lactation period (LP), and calving interval (CI) of Friesian cows in Egypt and Germany (Mittelwerte, Standardabweichung (SD) und Variationskoeffizient (CV) der unkorrigierten Werte für Frühmilchleistung (IMY), 305 Tage-Milchleistung (305-dMY), Laktationsdauer (LP) und Zwischenkalbezeit (CI) Schwarzbunter Rinder in Ägypten und Deutschland)

Trait	Egypt			Germany		
	Mean	SD	CV	Mean	SD	CV
IMY, kg	966	319	33	1552	318	21
305 dMY, kg	4736	1097	23	6641	1484	22
LP, day	298	62	21	301	10	3
CI, day	379	72	19	396	58	15

*Coefficients of variation computed from residual mean squares divided by the overall least squares means of a given by (Harvey Program, 1990).
** Number of records were 2422 in Egypt and 27756 in Germany.

In German Friesian cows, the mean of the lactation period (LP) also agrees with those reported by DELORENZO and EVERETT (1986) on Canadian Friesian cows, being 301 days and is within the range of estimates (281 and 319 day) obtained by DJEMALI and BERGER (1992) on Friesian cows in Florida and THORPE et al. (1994) on Friesian cows in Kenya. Our estimate for the LP was higher than that reported by GIBSON (1986) on Friesian cows in England (245 days). Usually the lactation period is 305-days. The animals will then be set dry for 2 months as preparturation for the following lactation. Actual mean for calving interval (CI) is in close agreement with that reported by EVERETT et al. (1966) on Guernsey cows (392 days) and THORPE et al. (1994) on Sahiwal cows (397 days).

Non genetic effects

Least squares analysis of variance shows that the season and year of calving and parity had a significant effect ($P<0.05$ and $P<0.01$) on all traits studied for Friesian cows in Egypt and Germany except the effect of year of calving on IMY, and 305-dMY in German Friesian cows was not significant (Table 3 and 4). The present results agree with those reported by SOLIMAN et al. (1989); RAY et al. (1992); DJEMALI and BERGER (1992); PTAK et al., (1993); HAMED and SOLIMAN (1994) and BAFFOUR-AWUAH et al., (1996) on different breeds of dairy cattle in different countries. Also, all concluded that differences in the milk yield attributed to the year of calving effect was interpreted to be due to climatic, nutritional and managerial conditions which changed from one year to another. In contrast, no significant effect of the year of calving on IMY and 305-dMY was reported by AMIN et al., (1996) with Friesian cows in Hungary. In addition, KHATTAB and SULTAN (1990) showed that the LP of Friesian cows was not significantly affected by year of calving.

In Egypt least squares means indicate that winter and spring calvers had the highest IMY and 305-dMY while summer and autumn calvers produced the lowest. In German Friesian cows the autumn calvers had the highest IMY and 305-dMY, winter calvers were intermediate, while the summer calvers produced the lowest. The high yield in Friesian cows in Egypt in winter and spring calvers could be attributed to mild climatic conditions, for abundant growth and availability of food quality fodder, e.g., Egyptian clover (Berseem), normally fed to the animals during the month of December to May. Due to this period of abundant green fodder supply, the animals which receive good management could be expected to respond well by expressing better production potentiality, while the decrease in their milk production in summer and autumn, may be due to the decrease in feed intake according to the amount offered and increase in environmental temperature.

In German Friesian cows, the high yield in the autumn season could be attributed to better climatic conditions, where cows grazed on natural grass, the amount of feed intake, special concentrates and feed utilization is generally increased. With a good management system the animals could be expected to respond well, expressed by better production potentiality. The decrease in milk production in summer may be due to an increase in temperature and less concentrate feeds. In any case the difference between the seasons in milk production was not high, even though it was significant. The effect of the season of calving on IMY and 305-dMY may be due to variation in atmospheric temperature, feed available at different months or seasons of the year and different management systems.

It is known that the effect of the climate on the performance is significant. BIANCE et al., (1965) cited that feed consumption in the lactating Holstein Friesian cows began to decline at 21°C, was depressed by 2% at 32°C and virtually stopped at 40°C environmental temperature.

In Egypt the least squares analysis shows that cows calving during the winter and spring season had a longer LP and CI than those calving during the summer and autumn season, while in Germany cows calving in autumn had the longest LP and CI in comparison to those calving during winter or summer. RAY et al., (1992) study on 19266 Holstein Friesian cows in Arizona, found a significant effect of season of calving on calving interval, cows in lactation 2, 4, 5 or 6 and calving in spring and summer had a similar calving interval. Cows, however, in 1 st calving in spring there was a significantly longer calving interval (400.2 days) than with those calving in summer (392.5 days). The same authors added that lactation three (3 rd) cows, freshening in spring had a significant shorter calving interval (372.5 days) than cows calving in summer (380.1 days).

The present least squares indicate that there was no specific trend for the effect of year of calving on IMY and 305-dMY in Friesian cows in Egypt. Also, the longest LP and CI was observed in year 1988 and 1989, whilst the shortest was in year 1991. In German Friesian cows no specific trend was noticed by the effect of the year of calving on the milk yield. However the least square means for German Friesian cows do not show a particular trend of the significant effect of the year of calving on the LP, but that the longest CI was during 1988 to 1992 and the lowest in 1980, 1981 and 1984. The effect of the year of calving on length of each of LP and CI could be due to the differences of practice of management and the variation in humidity and temperature. The high relative size of R^2 of the year of calving on the CI (Table 3 and 4) indicates the importance of the year of calving influences on the CI. It is important to consider the year of calving in the model to eliminate the effect to gain unbiased genetic parameters and breeding values.

Table 3
F-ratio and coefficient of determination (R^2) for factors affecting initial milk yield (IMY), 305-day milk yield (305-dMY), lactation period (LP) and calving interval (CI) of Friesian cows in Egypt (F-Wert und Bestimmtheitskoeffizient (R^2) für Einflußfaktoren auf Frühmilchleistung (IMY), 305-Tage-Milchleistung (305-dMY), Laktationsdauer (LP) und Zwischenkalbezeit (CI) Schwarzbunter Rinder in Ägypten)

Independent Variable	d.f	IMY		305-dMY		LP		CI	
		F	R^2	F	R^2	F	R^2	F	R^2
Sires	307	0.99	0.13	1.32**	0.22	0.87	0.14	1.30**	0.13
Cows:Sires	398	1.25**	0.17	2.40**	0.21	1.64**	0.20	1.15*	0.13
Season of calving	11	13.79**	0.02	12.72**	0.01	8.49**	0.03	3.89**	0.04
Year of calving	5	61.61**	0.10	158.30**	0.17	51.19**	0.08	128.92**	0.18
Parity	4	11.87**	0.02	3.82**	0.01	19.70**	0.02	33.04**	0.04
Regressions									
Age at calving(L)	1	0.271		2.736		0.006		0.350	
Age at calving(Q)	1	0.425		13.880**		0.192		3.094	
Remainder	1694	0.56		0.38		0.53		0.48	
Remainder M.S		71682		724959		2615		11712	

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

Least squares means show that the milk yield increased with increased lactation order. With advanced age, the animal is mature, the body weight and size is fully developed, accompanied by the increase in size and function of the digestive and circulatory system, mammary glands and the other body systems. The amount of feed intake and feed utilization are generally increased and associated with increased efficiency of milk synthesis and secretion of the udder glandular tissues. The milk yield increased with advance of age until the highest production was attained at the third lactation as reported by VACCARO et al., (1995) with Zebu and Zebu crossbred, on the fourth lactation by KHANNA and BHAT (1972) with Sahiwal x Holstein Friesian cattle, and on the fifth lactation as reported by REGE (1991) on Holstein Friesian cows.

Table 4
F-ratio and coefficient of determination (R^2) for factors affecting initial milk yield (IMY), 305-day milk Yield (305-dMY), lactation period (LP) and calving interval (CI) German Friesian cows (F-Wert und Bestimmtheitskoeffizient (R^2) für Einflußfaktoren auf Frühmilchleistung (IMY), 305-Tage-Milchleistung (305-dMY), Laktationsdauer (LP) und Zwischenkalbezeit (CI) Schwarzbunter Rinder in Deutschland)

Independent Variable	d.f	Traits							
		IMY		305-dMY		LP		CI	
		F	R^2	F	R^2	F	R^2	F	R^2
Sires	658	3.69**	0.17	3.69**	0.17	1.24**	0.04	1.09**	0.04
Cows:Sires	8410	5.01**	0.56	5.01**	0.57	1.42**	0.37	2.53**	0.43
Season of calving	2	5.14**	0.01	5.15**	0.01	2.65**	0.01	17.22**	0.01
Year of calving	14	1.29	0.00	1.29	0.00	2.12**	0.01	6.95**	0.13
Parity	2	171**	0.01	156.4**	0.01	86.9**	0.01	87.09**	0.01
Regressions									
Age at calving(L)	1	29.14**		69.16**		2.19		2.32	
Age at calving(Q)	1	52.89**		186.89**		9.76**		14.19**	
Remainder	18667	0.25		0.24		0.56		0.38	
Remainder M.S		25017		625401		2181		2155	

* Significant at ($P<0.05$) ** Significant at ($P<0.01$)

The differences in the highest lactation yields observed in different lactation orders could not possibly only be due to breed maturity but also to differences in kind of feeds, management, humidity conditions, age at first calving and dry period. When heifers freshen at a later age, they are nearer to maturity than when they calve at an earlier age. On the other hand, the animals which have a long dry period and receive good feeding quality and quantity during the first two calving intervals, have a chance to reach their mature body weight and maximum size at an earlier lactation than the other. Accordingly, they reach their maximum productivity at earlier parities.

In Egypt the least squares means indicate that the lactation period increased steadily with parity to the fourth parity, while calving interval increased until the fifth parity. In Germany, the longest LP and CI was found in the first lactation while the shortest was in the third lactation. WARD et al., (1988) on Kenana cattle in Sudan, found increasing calving intervals as cows aged, and the authors added that they interpreted this increasing in age due to older cows becoming increasingly incapable of supporting the combined stresses of environment, lactation and pregnancy.

In Friesian cows in Egypt, estimates of partial linear and quadratic regression coefficients of each of IMY, 305-dMY, LP and CI on age at calving were not significant, except quadratic regression coefficient for 305-dMY on age at calving, being 3.959 ± 1.959 kg/mo and -0.028 ± 0.004 kg/mo^2, respectively for IMY, 19.793 ± 11.966 kg/mo and -0.9516 ± 0.139 kg/mo^2, respectively for 305-dMY, 0.5501 ± 0.188 d/mo and 0.0036 ± 0.0008 d/mo^2, respectively, for LP and -1.900 ± 1.520 d/mo and 0.0309 ± 0.0017 d/mo^2, respectively for CI. Constants of partial linear and quadratic regression coefficients indicate that age at calving was negatively associated with CI, while it showed positive association with other traits. Similarly, ABDEL GLIL (1991) on Friesian cows, showed non-significant linear regression coefficients for 305-dMY and LP on age at calving in different parities except for the first parity only. In addition, EVERETT et al. (1966) found that the linear regression of CI on age at calving was negative. The present results indicate that older cows had more milk yield and longer lactation period and calving interval. In German Friesian cows, estimates of partial linear and quadratic regression coefficients of IMY, 305-dMY, LP and CI on the age at calving were highly significant, except linear regression coefficient for LP and CI on age at calving, being, 10.531 ± 0.770 kg/mo and -0.225 ± 0.0013 kg/mo^2, respectively for IMY, 52.651 ± 3.851 kg/mo and -1.123 ± 0.064 kg/mo^2, respectively for 305-dMY, -0.699 ± 0.044 d/mo and 0.0005 ± 0.0007 d/mo^2, respectively for LP and -15.967 ± 0.226 d/mo and 0.0208 ± 0.004 d/mo^2, respectively for CI. Constants of partial linear and quadratic regression coefficients indicate that age at calving was negatively associated with LP and CI, while associated positively with milk yield. Also, the present results indicate that older cows had more milk yield but less in each lactation period and calving interval. ABDEL GLIL (1991) with Friesian cows in Egypt found that non-significant regression coefficients for 305-dMY and LP on age at calving in different parities except for the first parity only. In addition, Everett et al., (1966) on Ayrshire and Holstein Friesian cows, found that the linear regression coefficients of calving interval on age at calving were negative.

Genetic parameters

Results obtained in the present study show that sires were significantly affected ($P<0.01$) upon all traits studied, except IMY and LP of Friesian cows in Egypt (Table 3 and 4). Most of these findings are in agreement with the results obtained by ABUBAKAR et al. (1986 b); SOLIMAN et al., (1989), KAFIDI et al., (1992); DIMOV et al., (1995), and BAFFOUR-AWUAH et al., (1996) working on different breeds of dairy cattle in different countries. KHATTAB and SULTAN (1990) working on Friesian cows in Egypt, found that there is no significant sire effect on the LP, but accounted for 2.01% variance on LP. Also, the effect of cows within sires was highly significant on all traits studied (Table 3 and 4). Similarly, ABUBAKAR et al. (1986 b) and DIMOV et al. (1995) on different breeds of dairy cattle in different countries, reported a significant effect of cows within sires on IMY and 305-dMY.

Heritability (h^2)

Heritability estimates for IMY, 305-dMY, LP and CI for Friesian cows in Egypt and Germany are given in (Table 5 and 6). Heritability estimate for IMY was lower (0.24) in Friesian cows in Egypt than German Friesian cows (0.34), and together agreed with estimates reported by AGYEMANG et al. (1985) and BAFFOUR-AWUAH et al. (1996), ranging from 0.24 to 0.41 with different breeds of dairy cattle in different countries. Estimates of heritability for 305-dMY is 0.22 and 0.24 for Friesian cows in Egypt and Germany, respectively. The present result is nearly in close agreement with those estimates obtained by AGYEMANG et al., (1985) on Holstein Friesian cows in New York; DONG and VAN VLECK (1989 b) with Holstein cows in California, New

York and Wisconsin and JAIRTH et al. (1995) with Canadian Holstein and, ranging from 0.21 to 0.25.

In addition, SHARMA et al. (1987) in a study based on 310 Hariana cows, found that the production of the middle month has higher h^2 estimates than earlier or later months of lactation, indicating that genetic improvement for milk production can be made by selecting cows on the basis of the fourth month. KHAN and JOHAR (1985) reported that the relative efficiency of selection is 0.95 and 0.71 based on first 90dMY as compared up to 270-dMY and 300-dMY, respectively. The present estimates indicate moderate h^2 for IMY and 305-dMY, therefore the present estimates concluded that according to the h^2 rapid progress will be made on selection on a basis initial milk yield than selection on basis 305-day milk yield. SOLIMAN et al., (1989) working on Pinzgauer cows, reported that heritability estimates for 100-dMY ranged between 0.36 to 0.52 and ranged from 0.32 to 0.47 for 305-dMY. They added that the higher estimates of heritability indicate a relatively large contribution of additive variances.

Higher estimates of h^2 of 305-dMY were obtained by many workers in different countries. LIN and ALLAIRE (1978) working on 2312 lactation records of Holstein Friesian cows, found that h^2 for 305-dMY was 0.49. MISZTAL et al., (1992) analysed 20836 lactation records of Holstein cows from dairy herd improvement in USA between 1982 and 1988, they came to the same result (h^2 =0.44). In contrast, lower estimates of heritability for 305-dMY were reported by ABUBAKAR et al., (1986 a) on 31722 lactation records of Holstein Friesian cows. They found that the h^2 for 305-dMY was 0.07. The same authors concluded that the estimate could be a function of a small number of records used for analysis. Also, SALLAM et al., (1990) working on Friesian cows in Egypt, obtained the same estimate of the h^2 for 305-dMY (0.10 ± 0.09) and not significantly different from zero.

Heritability estimate for LP and CI was higher in Friesian cows in Egypt than German Friesian cows (Table 5 and 6). However, the present value is small and indicates that the major part of the variation in these traits is due to non-genetic factors. In addition, great improvement in these characters could be possible by improving feeding and management systems. The present estimate for LP agrees and is within estimates (0.03 to 0.17) which were reported by RAGAB et al. (1987); and AFIFI et al. (1992 b). on different breeds of dairy cattle. Also, The present estimate of h^2 for CI agrees and is within estimates (0.00 to 0.17), estimated by EVERETT et al. (1966); DONG and VAN VLECK (1989 a); DONG and VAN VLECK (1989 b) and CAMPOS et al., (1994) on different breeds of dairy cattle in different countries.

Table 5
Estimates of heritabilities (diagonal), phenotypic (above diagonal) and genetic (below) correlations for initial milk yield (IMY), 305-day milk yield (305-dMY), lactation period (LP) and calving interval (CI) of Friesian cows in Egypt (Schätzwerte für Heritabilität, phänotypische und genetische Korrelationen für Frühmilchleistung (IMY), 305-Tage-Milchleistung (305-dMY), Laktationsdauer (LP) und Zwischenkalbezeit (CI) Schwarzbunter Rinder in Ägypten)

Traits	IMY	305-dMY	LP	CI
IMY	**0.24±0.03**	0.47	0.19	0.23
305-dMY	0.96	**0.22±0.06**	0.33	0.29
LP	0.31	0.74	**0.14±0.04**	0.43
CI	0.38	0.69	0.43	**0.16±0.06**

a = all correlations different from zero; b = standard errors of genetic correlations ranged from 0.02 to 0.09

Table 6
Estimates of heritabilities (diagonal), phenotypic (above diagonal) and genetic (below) correlations for initial milk yield (IMY), 305-day milk yield (305-dMY), lactation period (LP) and calving interval (CI) of German Friesian cows (Schätzwerte für Heritabilität, phänotypische und genetische Korrelationen für Frühmilchleistung (IMY), 305-Tage-Milchleistung (305-dMY), Laktationsdauer (LP) und Zwischenkalbezeit (CI) Schwarzbunter Rinder in Deutschland)

Traits	IMY	305-dMY	LP	CI
IMY	**0.34±0.02**	1.00	0.26	0.22
305-dMY	1.00	**0.24±0.02**	0.29	0.24
LP	0.35	0.48	**0.08±0.01**	0.29
CI	0.59	0.60	0.49	**0.09±0.01**

a = all correlations different from zero
b = standard errors of genetic correlations ranged from 0.00 to 0.11

On the other hand, higher estimates of the h^2 for LP were reported by SHARMA et al. 1982 on Hariana cattle and Sallam et al. (1990) with Friesian cows in Egypt, ranging from 0.32 to 0.41. Also, the higher estimate of h^2 for CI reported by KAFIDI et al. (1992) with Friesian cows, came to the same result (0.36). In addition, the reproductive traits such as the calving interval, the major effect on it, its environmental factors, therefore improvement of the managerial technique, should lead to a considerable improvement of the reproductive traits.

Correlations

Genetic correlations between different traits studied were positive and significant, ranging from 0.31 to 0.98 in Friesian cows in Egypt and from 0.35 to 1.00 in German Friesian cows (Table 5 and 6). High genetic correlation between IMY and 305-dMY was found. The present estimate was the same reported by HAMED and SOLIMAN (1994) and BAFFOUR-AWUAH et al. (1996), ranging from 0.86 to 1.00. Genetic correlation near unity between IMY and 305-dMY indicates that selection for high yield of IMY will be associated with genetic improvement in the corresponding traits of 305-dMY. The negative effect can be the selection for early mature animals.

AGYEMANG et al. (1985) working on first lactation of Holstein Friesian cows, based on the performance of their daughters during the first 90, second 90 and third 90 day milk yield of lactation, found that genetic correlations between three trimesters were positive and ranged from 0.74 to 1.00. The authors added that the high genetic correlations indicated that yield in any of the early intervals could be used to predict later yields. Also, the same authors concluded that the milk yield for second trimester was a better indicator than yields for the first or the third trimester for predicting total yields.

Our genetic correlation estimates between LP and each of IMY, 305-dMY agree with those obtained by ABUBAKAR et al. (1986 a); RAGAB et al. (1987) and ZARNECKI et al. (1991), on Friesian cows in different countries and ranging from 0.42 to 0.87. The present estimates indicate that genes associated with long lactation periods are correlated with genes favourable for milk yield. Also, high positive estimates of genetic correlation were obtained between CI and IMY and 305-dMY (Table 5 and 6). In this respect, EVERETT et al., (1966); DONG and VAN VLECK (1989 a) and SHORT and LAWLOR (1992), working on different breeds of dairy cattle in different countries, found genetic correlations between calving interval and milk yield ranged between 0.17 and 0.51.

On the other hand, REGE (1991) working on Friesian cows in Kenya, found that genetic correlation between 305d-MY and CI was -0.032, although numerically negative, this value was not significantly (P<0.05) different from zero, and hence does not rule out the possibility of on underlying antagonism between these traits, which emphasizes the need to formulate selection programs which do not ignore reproductive performance. In addition, KAFIDI et al., (1992) estimated genetic correlation between milk yield and current calving interval was 0.33, indicated that genetic improvement in milk production has an unfavourable effect on breeding efficiency.

Genetic correlations between LP and CI in this study are 0.43 and 0.49 in Friesian cows in Egypt and Germany, respectively (Table 5 and 6). Similarly positive genetic correlations between the lactation period and calving interval was obtained by AFIFI et al. (1992 b), ranging from 0.00 to 0.98. The present results indicate that the lactation period and calving interval are important in determining milk yield. In other words, high productive cows with long calving intervals tend to lactate for a longer time.

Estimates of phenotypic correlation (r_p) between different traits studied are given in (Table 5 and 6). The phenotypic correlations between IMY and 305-dMY were positive and highly significant in Egypt and Germany. Phenotypic correlation is the same as genetic correlation between IMY and 305-dMY, both equal unity, indicating that the phenotypic correlations reflect the genetic true for the animal. In addition, this estimate indicates that the IMY can be a good indicator of production in 305-dMY, and it can be used for evaluating the milk producing ability in cows. SOLIMAN et al. 1989 and BAFFOUR-AWUAH et al. (1996), obtained positive and varied significant (P<0.05 or P<0.01) phenotypic correlations between IMY and 305-dMY, ranging between 0.34 and 0.99 with different breeds of dairy cattle in different countries. In addition, SOLIMAN et al. (1989) working on Pinzgauer cattle, reported that the phenotypic correlation between 100-dMY and 305-dMY was 0.60. They concluded that milk yield in 100 days of lactation can be a good indicator of production in 305-dMY.

Estimates of phenotypic correlation between LP and IMY and 305-dMY were positive and significant (P<0.01) (Table 5 and 6). Our estimates show that the lactation period is important in determining the milk yield. SALLAM et al. 1990 and ZARNEKI et al. 1991 working on different breeds of dairy cattle in different countries, all came to the same conclusion.

The phenotypic correlations between CI and IMY and 305-dMY were 0.23 and 29, respectively in Friesian cows in Egypt and 0.22 and 0.24, respectively in German Friesian cows (Table 5 and 6). These results are nearly in agreement with those reported by DONG and VAN VLECK (1989a) and SHORT and LAWLOR (1992). All found that phenotypic correlations between milk yield and calving interval were positive and ranged from 0.12 to 0.31. On the other hand, EVERETT et al. (1966) reported that phenotypic correlation between 120 day milk yield and the current calving interval was -0.04 in Holstein cows and -0.03 in Guernsey cows. The authors attributed these results to the fact that the better cows received better management for breeding efficiency. KAFIDI et al. (1992) working on Friesian cows, came to the same result (-0.04).

Phenotypic correlation between CI and LP was positive (Table 5 and 6). In this respect, Gibson (1986) found that phenotypic correlation between CI and LP was 0.34 and 0.41 in Jersey and Friesian cows, respectively. In contrast, AFIFI et al. (1992 b) obtained negative but low phenotypic correlation between CI and LP and ranged from -0.11 to 0.01 on Friesian cattle.

It could be concluded from the present study that producing ability in German Friesian cows was higher than Friesian cows in Egypt. Also, CI was longer in German Friesian cows than in Egypt, while LP in German Friesian cows was shorter than that in Egypt. Low heritability estimates for LP and CI in the present study indicate that the major part of all variation in the lactation period within the lactational length of 305-days is possibly due to non-genetic factors and little improvement for these traits for Friesian cows in Egypt and Germany can be expected by selection. A great improvement in these traits could be possible by improving feeding and management systems. Positive genetic correlations between LP and each of IMY and 305-MY, also between CI and each of IMY and 305-dMY indicate that selection for any of IMY or 305-dMY would improve each of LP and CI. High genetic correlation in the present study between 305-dMY and IMY, indicates the selection for high yield of IMY will be associated with genetic improvement in the corresponding traits of 305-dMY for Friesian cows in Egypt and Germany.

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