http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Science, 2 (1): 31-37, 1999 *Research Article*

Ratio and Regression Factors for Predictinc 305 Day Production from Part Lactation Malik Records in a Herd of Holstein Friesian Cattle

H. Atil
Faculty of Agriculture, Ege University, Department of Animal Husbandry, Izmir, Turkey

Abstract
A normal 3780 lactation records of Holstein Friesian cattle were collected from Dena Farm in Egypt during the period from 1988 to 1996. The means of cumulative milk yield were 535, 1196, 1837, 2419, 2941, 3392, 3777, 4081, 4332 and 4533 kg for 30, 60, 190, 120, 150, 180, 210, 240, 270 and 305 days milk yield (dMY), respectively. Least squares analysis of variances showed highly significant effects of month and year of calving, parity as a fixed effects, sire and cow within sires as random effects on cumulative monthly milk yield. Heritability estimates were 0.23, 0.25, 0.25, 0.29, 0.32, 0.32, 0.33, 0.34 and 0.35 for ten period of cumulative milk yield. All phenotypic and genetic correlations between different traits were significant ($p<0.01$). The range of ratio factors for different cumulative milk yield were estimated as 1.07 to 8.47. Estimates of partial linear and quadratic regression coefficients of 305 day milk yield on cumulative monthly milk yield were significant, The accuracy of prediction (R^2) increased with the increase in the number of cumulative milk yield. Records of the first seven months of lactation are considered sufficient for predicting 305 day milk yield. The predicted 305 day milk yield is more accurate using the regression method from ratio factors.

Introduction

The desirability of utilizing available information for sire evaluation has increased the importance of monthly test-day records. Incomplete records when extended to a complete equivalent can be used together with complete records to estimate the genetic merit of sires, because of high genetic correlation between complete production records and part of production (Madden *et al.*, 1955; Van Vleck and Henderson, 1961; Ashmawy *et al.*, 1985; Khattab *et al.*, 1987; Khattab and Mourad, 1992; Abdel Glil *et al.*, 1995).

Incomplete records seem to have an important bearing in dairy cattle selection not only for sire eveluation but also for culling cows from the herd (Van Vleck and Henderson, 1961; Ashmawy *et al.*, 1985).

Sudarwati *et al.* (1995) used three methods to predict lactation milk yield (1) incomplete gamma function (model 1); 2) polynomial inverse function (model 2) and 3) nonlinear regression (model 3). They concluded that model 2 was able to estimate the time to reach peak yield close to the actual data using part lactation records and model 2 could be used as a tool to advise farmers on appropriate feeding and management practices to be adopted.

The objectives of this study were: to estimate phenotypic and genetic parameters affecting cumulative monthly milk yield and to separate factors for predicting 305 day milk yield from part lactation records for Holstein Friesian cattle.

Materials and Methods

Data: A total of 3780 normal complete lactation records of cows from the Holstein herd maintained at Dena Farm (far from Cairo by 80 km), during the period from 1988 to 1996 was used in this study. A total number of sires, cow within sires and average of daughters per sire were 345, 1297 and 10.68 respectively. The genetic analysis included the sires which have more than five daughters. Each record including code of sire, code of cow, data of calving, lactation number, monthly milk yield and 305 (dMY). Monthly milk yield as defined as the amount of milk production in a 4 weeks period, since it was calculated from the weekly records. Traits included in this study were cumulative monthly milk yield (CMY) in the first one, first two..., or the first nine months of lactation and 305 dMY.

Cows were grazed on Egyptian clover (Alfalfa) during December to May. During the rest of year, the animals were fed on concentrate mixture along with rice straw and limited amount of hay when available. Cows producing more than 10 kg a day and those that are pregnant in the last two months of pregnancy were supplemented with extra concentration ration. Cows were machine milking twice a day and milk yield are weighted by kg.

Analysis: Data were analysed using Mixed Model Least Squares and Maximum Likelihood computer program (Harvey, 1987). The following mixed model (1) was used to study CMY and 305 dMY.

$$Y_{ijklmn} = \mu + S_i\text{-}d_{ij} + M_k + R_1 + P_m + e_{ijklmn}$$

Where

Y_{ijklmn} : the cumulative monthly milk yield and 305 day milk yield.

μ : the overall ,ean; S_i : random effect of i^{th} stre;

d_{ij} : the random effect of the j^{th} dam nested within the i^{th} sire.

M_k : the fixed effect of the k^{th} month of calving (k = 1, 2, ... 12).

R_l : the fixed effect of l^{th} year of calving (l = 88, 89, ..., 96).

P_m : the fixed effect of the m^{th} parity (m = 1, 2, ..., 6) and

e_{ijklmn} : the random errors.

Two methods for predicting 305 dMY from CMY were used (Van Vleck and Henderson, 1961; Ashmawy *et al.,* 1985; Abdel Glil *et al.,* 1995):

The first method was to obtain a ratio of total production in 305 days to part production, for the average animal, as the multiplies for actual individual part production needed to give an estimate of 305 days production from model (1).

The second method was to obtain linear regression equations for predicting 305 day milk yield from part lactation records.

The following linear model (2) was used to predict 305 dMY from CMY.

$$Y_{ijklmn} = \mu + S_i + d_{ij} + M_k + R_l + P_m + b_{1L}, (X_{ijklmn} - \bar{x} + b_{2Q} [X_{ijklmn} - \bar{x}]$$

where b_{1L} and b_{2Q} are partial linear and quadratic regression coefficients of 305 dMY on CMY; X_{ijklmn}. The cumulative monthly milk yield in the first one, the first two,..., or the first nine months of lactation, and *X:* The average of CMY. The other terms are defined in model(1).

Estimates of sire variance (σ_s^2) were calculated according to method II of Henderson (1953). Estimates of heritability, phenotypic and genetic correlation with standard errors and phenotypic correlation were estimated according to Harvey (1987).

Results and Discussion

Means and variation of uncorrected records: Unadjusted means for CMY, standard deviations and coefficients of variability are presented in Table 1, Means for CMY were 538, 1179, 1795, 2362, 2873, 3327, 3723, 4060, 4327 and 4516 kg for 30, 60, 90, 120, 150, 180, 210, 240; 270 and 305 dMY, respectively. The present means are higher than those reported by Khattab *et al.* (1987) using another herd of Friesian cattle in Sake and El-Karada experimental farms in Egypt being they reported 347, 710, 1028, 1319, 1591, 1844, 2078, 2312, 2527, 2697 kg for the same period, respectively. While, Hussein (1996) using another commercial herd of Holstein Friesian in Egypt found that the average 90, 180 and 305 dMY were 1748, 3410 and 4938 kg , respectively. Also, Mohammad (1991) with a commercial herd of Friesian cows in Egypt reported that the average means of 90 and 305 dMY were 1503 and 3838 kg, respectively. The present mean of 305 dMY is lower than those reported by Yener *et al.* (1994), Atay *et al.* (1995) and Onenec (1997) working on Holstein Friesian cows in Turkey, being 6777, 5490 and 4790 kg, respectively. Kaya (1996) working on five herds of Holstein Friesian cows in Turkey found that the average initial milk yield (50 dMY) were 910, 1100, 1179, 1193 and 1178 kg, the average 100 dMY were 1812, 2165, 2324, 2346, 2315 kg and the average 305 dMY were 4696, 4332, 5695, 5739 and 5694 kg.

The differences between the present means and the others means reported by other workers on different countries could be due to differences in climatic and managerial conditions and/or genetic differences in herds. The coefficients of variability for CMY ranged from 26.94 to 42.10 percent (Table 1), indicating that cows at the commercial farms were higher in the milk yield than cows of the government farms and this may be due to better management and feeding system prevailing in their commercial farm than in government ones.

Table 1: Unadjusted means, standard deviations (SD) and coefficients of variability for cumulative monthly milk yield (CMY) and 305 day milk yield

Traits	Mean	SD	CV(%)
30 dMY	538	227	42.10
60 dMY	1179	370	31.41
90 dMY	1795	512	28.51
120 dMY	2362	647	27.39
150 dMY	2873	774	26.94
180 dMY	3327	902	27.11
210 dMY	3723	1028	27.62
240 dMY	4060	1157	28.48
270 dMY	4327	1278	29.54
305 dMY	4516	1383	30.62

Analysis of fixed effects: Least squares analysis of variances of different traits studied are presented in Table 3. Effects of month, year of calving and parity on CMY are significant ($p<0.01$).

Table 2 show that cows calving during winter and spring months had higher CMY than those calving during summer and autumn seasons. This may be due to attributed to the favourable climatic conditions and availability of food quality clover (berseem) during winter and spring seasons. The present results are similar to those obtained by Asker *et al.* (1962); Ragab *et al.* (1973), Kassab *et al.* (1987), Ashmawy *et al.* (1985) and Abdel Glil *et al.* (1995) working on Friesian cows in Egypt and the results obtained by Cooper and Hargrove, (1982), Soliman *et al.* (1989), Vij *et al.* (1995), Gaur and Raheja (1996), Lopes *et al.* (1996) and Souza *et al.* (1996) working on different breeds of dairy cattle in different countries. While, Kaya (1996) working on Holstein Friesian in Turkey found that cows calving during summer season had the highest 305 dMY than the others seasons. In addition, Khalil *et al.* (1992) working on Egyptian buffaloes, found that summer calves had the highest 90 dMY, 180 dMY and 305 dMY.

Vargas and Solano (1995) working on six breeds of dairy cattle in Spain, found that cows calving in the dry season generally had lower than average milk yield.

On the other hand, no significant effect of season of calving on CMY was reported by Qureshi *et al.* (1995) working on 167 Gir cows.

No specific trend was noticed for the significant effect of year of calving on CMY (Table 2). Significant effect of year of calving on CMY were reported by Garroni and Verde (1976), Koley *et al.* (1981), Cooper and Hargrove (1982),

Table 2: Constants ± SE for factors affecting CMY in Holstein Friesian cattle

Classification	N	30 dMY	60 dMY	90 dMY	120 dMY	150 dMY	180 dMY	210 dMY	240 dMY	270 dMY	305 dMY
LS mean	3780	535.1±9.7	1195.6±15.5	1836.7±21.7	241.9±28.9	2941.7±36.7	3391.8±43.8	3776.6±51.7	4084.1±60.1	4331.9±67.7	4532.5±74.5
Month of calving											
1	266	41.5±16.7	53.5±24.2	98.5±31.6	149.6±38.9	227.7±46.1	284.7±53.1	331.4±60.6	359.2±68.5	390.2±76.2	443.8±82.8
2	277	58.1±16 3	111.7±23.7	186.2±31.0	256.4±38.0	321.3±45.1	333.5= 52.0	328.7±59.3	321.7±67.0	346.9±74.5	378.4±81.1
3	304	32.1±15.0	74.6±21.7	148.6±28.4	194.6±34.8	200.7±41.3	201.5±47.6	210.3±54.3	221.8±61.4	221.8±68.3	242.6±74.2
4	240	-0.7±16 6	39.1±24.0	70.7±31.4	64.4 - ±38,6	39.4±45.8	6.7±52.8	-19.6±60.2	-47.7±68.0	-57.1±75.7	-61.4±82.3
5	241	14.8±6.60	61.5±24.1	49.4±31.5	37.3±38.6	5.0±45.8	-5.9±52.8	-29.1±60.3	-51.6±68.1	-70.4±75.7	-57.4±82.4
6	232	-27.6±16.6	-57.1±24.1	-89.1±31.5	-106.1±38.7	-125.4±45.9	-154.3±52.9	-194.5±60.3	-248.9±68.2	-269.4±75.8	-259.0±82.4
7	328	-44.7±13.6	77.8±19.8	-125.0±25.9	-168.6±31.8	-221.5±37.6	-265.1±43.4	-310.7±49.5	-333.2±56.0	-334.7±62.2	-318.9±67.7
8	401	-25.4±12.5	-68.7±18.2	-115.8±23.8	-153.3±29.2	-194.4±34.6	-239.4±40.0	-272.3±45.6	-280.3±51.5	-2881.3±57.3	-292.1±62.3
9	436	-31.8±11.9	-59.9±17.2	-92.7±22.5	-120.3±27.7	-158.7±32.8	-158.3±37.9	-152.4±43.2	-136.4±48.8	-117.6±54.3	-127.5±59.0
10	375	-11.3±12.9	-33.5±18.7	-80.0±24.4	-123.0±30.0	-122.2±35.5	-111.4±41.0	-99.7±46.8	-69.2±52.8	-71.0±58.8	-100.6±63.9
11	319	6.5±14.3	-21.3±20.8	-51.3±27.2	-64.3±33.3	-63.2±39.5	-38.8±45.6	9.5±52.0	40.3±58.8	35.6±65.3	-22.8±71.1
12	361	-11.5±14.4	-22.2±20.8	0.3±27.2	33.2±33.5	81.1±39.7	147.0±45.8	198.5±52.2	224.4±59.0	214.0±65.6	174.8±71.3
Year of calving											
88	474	-108.8±56.3	-172.5±81.6	-184.9±106.7	-250.3±131.0	-276.7±155.3	-247.1±179.2	-107.4±204.3	66.7±230.9	389.1±256.8	869.6±279.3
89	498	70.9±42.7	142.0±61.8	207.1±80.9	-247.8±99.4	280.6±117.8	323.4±135.9	410.4±154.9	489.4±175.1	645.9±194.7	921.8±211.7
90	473	48.3±29.2	70.7±42.3	85.4±55.4	49.1±68.0	-3.3±80.6	-57.0±93.0	-75.2±106.1	-62.4±19.8	26.3±133.3	207.7±145.0
91	506	44.1±16.7	20.9±24.8	-20.2±31.6	-88.9±38.9	-155.8±46.1	-206.2±53.1	-221.3±60.6	-211.7±68.5	-169.6±76.1	-86.7±82.8
92	649	-10.3±10.4	-70.0±15.1	-127.6±19.7	-174.9±24.3	-218.4±28.8	-236.6±33.2	-247.3±37.8	-260.2±42.7	-282.3±47.5	-323.7±51.7
93	528	-38.4±17.3	127.5±25.1	-213.1±32.9	-290.5±40.4	-361.2±47.9	-434.9±55.2	-505.4±63.0	-560.2±71.2	-645.8±79.1	-762.4±66.1
94	379	-14.4±29.0	-21.1±42.1	-14.1±55.1	25.9±67.6	56.4±80.2	72.6±92.5	49.3±105.5	14.4±119.2	-69.1±132.6	-247.6±144.2
95	225	36.0±43.5	103.4±63.0	193.0±82.4	309.2±101.2	415.5±120.0	500.0±138.4	510.2±147.8	499.2±178.4	392.1±198_4	160.8±215.8
96	48	-27.4±63.9	54.1±92.7	74.5±121.2	172.6±148.9	262.9±176.5	285.7±203.6	186.7±232.2	24.9±262.4	-286.6±291.8	-740.4±217.4
Parity											
1	1277	-54.0±39.8	-112.7±57.7	-191.0±75.5	-204.6±92.7	-201.5±109.9	-196.9±128.8	-220.5±144.6	220.2±163.4	-208.0±181.7	-472.8±197.6
2	949	34.5±24 7	67.6±35.8	81.6±46.8	105.2±57.5	123.1±68.1	150.7±78.6	156.2±89.7	173.1±101.3	143.7±112 7	33.3±122.5
3	681	64.2±12.2	122.3±17.7	171.4±23.1	220.2±28.4	257.5±33.7	293.6±38.9	320.2±44.3	337.7±50.1	330.0±55.7	285.4±60.6
4	472	45.5±12.6	92.8±18.3	137.9±3.9	164.3±29.3	186.5±34.8	202.7±40.1	231.4±45.7	252.5±51.7	284.1±57.5	332.6±62.5
5	304	-8.9±24.9	-17.5±36.0	-8.1±47.1	-21.6±57.9	-46.0±68.6	-68.3±79.2	-74.7±90.3	-94.9±102.0	-73.0±113.5	31.7±123.4
6	97	-81.2±44.3	-152.4±64.2	-191.8±84.0	-263.5±103.2	-319.6±122.3	-381.9±141.0	-412.6±160.8	-448.2±181.7	396.8±202.2	-210.2±219.8

Table 3: Least squares analysis of variance for factors effecting cumulative monthly milk yield and 305 day milk yield in Holstein Friesian cattle

Souce of variation	d.f.	F values 30	60	90	120	150	180	210	240	270	305
Sire	344	1.77**	1.69**	1.71**	1.78**	1.87**	1.85**	1.87**	1.89**	1.89**	1.90**
Caw:Sire	952	0.93	1.19**	1.39**	1.53**	1.64**	1.81**	1.92**	2.00**	2.06**	2.09**
Month of calving	11	2.89**	5.26**	8.57**	10.45**	11.51**	11.77**	11.54**	10.29**	8.80**	7.67**
Year of calving	8	20.01**	33.40**	39.58**	47.25**	50.25**	50.88**	47.30**	41.34**	37.19**	35.22**
Parity	5	22.11**	41.29**	50.53**	48.96**	43.67**	40.59**	37.45**	33.11**	28.81**	24.83**

*($p<0.05$) **($p<0.01$)

Table 4: Heritability estimates with standard errors (on diagonall, correlation with standard errors (below diagonall and pphenotypic correlation above diagonal between different tracts studied)

Traits (dMY)	30 dMY	60 dMY	90 dMY	120 dMY	150 dMY	180 dMY	210 dMY	240 dMY	270 dMY	305 dMY
30	0.23±0.051	0.85	0.73	0.64	0.58	0.53	0.48	0.44	0.40	0.37
60	1.00±0.019	0.25±0.052	0.94	0.87	0.81	0.76	0.71	0.66	0.62	0.59
90	0.93±0.039	0.96±0.012	0.25±0.053	0.97	0.92	0.84	0.83	0.78	0.74	0.71
120	0.83±0.056	0.91±0.025	0.98±0.006	0.29±0.055	0.98	0.94	0.90	0.86	0.82	0.79
150	0.77±0.065	0.88±0.034	0.97±0.012	1.00±0.003	0.32±0.057	0.98	0.95	0.92	0.88	0.85
180	0.72±0.074	0.83±0.043	0.94±0.021	0.99±0.007	1.00±0.002	0.32±0.057	0.99	0.96	0.93	0.90
210	0.67±0.081	0.79±0.051	0.90±0.028	0.96±0.013	0.98±0.006	1.00±0.002	0.33±0.058	0.99	0.97	0.94
240	0.65±0.085	0.77±0.056	0.88±0.034	0.95±0.019	0.97±0.011	0.99±0.005	1.00±0.001	0.34±0.058	0.99	0.97
270	0.61±0.090	0.74±0.063	0.85±0.041	0.92±0.025	0.95±0.016	0.98±0.008	0.99±0.004	1.00±0.001	0.34±0.059	0.99
305	0.58±0.067	0.71±0.067	0.83±0.046	0.91±0.029	0.93±0.020	0.97±0.012	0.98±0.006	0.99±0.003	1.00±0.001	0.35±0.059

Kassab *et al.* (1987), Khattab *et al.* (1987), Khalil *et al.* (1992), Abdel Glil *et al.* (1995), Vargas and Solano (1995) Gaur and Raheja (1996), Hussein (1996), Kaya (1996), Lopes *et al.* (1996) and Souza *et al.* (1996) working on different breeds of dairy cattle in different countries. The influence of year of calving on CMY is attributed mainly due to different nutritional, climatic conditions, management practices prevalent over different times and phenotypic trend. Kassab *et al.* (1987) in a study based on 2531 normal lactation records of Friesian cattle in Egypt found that year of calving accounted for 11.7 and 11.2 percent of the total variation on initial milk yield and maximum milk yield, respectively. Also, Cooper and Hargrove (1982) analysed 15867 lactation records of Friesian cattle, found that including year of calving in the model increased R^2 by 1 percent.

Lactation order had a significant effect on CMY (Table 3). The present results are agree with the results obtained by Ragab *et al.* (1973), Garroni and Verde (1976), Costa *et al.* (1982), Ashmawy *et al.* (1985), Kassab *et al.* (1987), Khattab *et al.* (1987), Vij *et al.* (1995), Gaur and Raheja (1996), Kaya (1996) and Souza *et al.* (1996) working on different breeds of dairy cattle in different countries. The present results indicate that the average CMY increase with the increase in order of lactation till the third lactatia and decreased after that (Table 2) and this is logically due to the increase in body weight combined with advancing age and to the full development of the secretary tissue of the udder. Hussein (1996) using another set of Holstein (Friesian cattle in Egypt found that the highest 90 dMY were reached in the third lactation, while, the highest 180 dM and 305 dMY were reached in the second lactation. Kaya (1996) reported that the highest milk yield traits (50 dMY, 100 dMY and 305 dMY) was reached in the fourth lactation and decrease after that. Also, Atay *et al.* (1995) report that the highest 305 dMY was attained during the fifth lactation.

The higher F value (Table 3) for the effects of year and parity on CMY indicated that year and parity are the most important nongenetic factors affecting CMY. Therefore, a model of analysis for describing milk yield traits should include the effects of these factors for appropriate analysis

Genetic Parameters

Sire variance components: Sire of the cow had a significant effect on CMY ($p<0.01$, Table 3). The present results are in agreement with those reported by Ragab *et al.* (1973), Kassab *et al.* (1987), Khattab *et al.* (1987), Khattab and Sultan (1990), Khalil *et al.* (1992), Abdel Glil *et al*. (1995), Gaur and Raheja (1996), Hussein (1996), Kaya (1996), Souza *et al*. (1996) and Tailor and Banerjee (1996). The present results indicate the possibility of genetic improvement of milk through selection.

Cow within sire components: Effect of cow within sire of different traits studied are significant ($p<0.01$, Table 3)

Table 5: Ratio factors for predicting 305 dMY from cumulative monthly milk yield, compared with other ratios from different workers

CMY	All data (3780*)	Abdel Gill *et al.* (1995)	Ashmawy *et al.* (1985)	Lamb and McGilliard (1967)	DHIA**
30 dMY	8.47	6.83	7.61	7.81	7.69
60 dMY	3.79	3.16	3.84	3.92	3.84
90 dMY	2.47	2.51	2.64	2.69	2.61
120 dMY	1.87	1.97	2.06	2.08	2.01
150 dMY	1.54	1.65	1.72	1.72	1.66
180 dMY	1.34	1.43	1.48	1.48	1.43
210 dMY	1.20	1.28	1.31	1.31	1.27
240 dMY	1.11	1.16	1.19	1.18	1.15
270 dMY	1.05	1.08	1.09	1.09	1.07

*Number of records averaged to obtain the ratio factors; **Cited by Madden *et al.* (1955)

Table 6: Estimates of partial Linear (b_{1L} and quadratic (b_{2Q}) regression coefficients of predicting 305 dMY from CMY for Holstein Friesian cattle

		Liner, kg/kg		Quadratic, kg/kg^2	
CM	μ*	b_1	±S.E.**	b_2	+S.E.**
1	4516.3	1.503	0.0964	0.000441	0.0003
2	4513.8	1.771	0.0602	-0.000088	0.0011
3	4474.8	1.685	0.0412	-0.000053	0.0001
4	4449.2	1.572	0.0295	-0.000017	0.0001
5	4440.3	1.454	0.0218	-0.000014	0.0001
6	4456.7	1.365	0.0156	-0.000017	0.0001
7	4473.3	1.267	0.01106	-0.000008	0.000001
8	4508.3	1.164	0.0067	-0.000003	0.000001
9	4523.3	1.074	0.0034	0.000003	0.000001

*Least squares mean of 305 day milk yield; ** Standard errors of partial regression coefficients

Variances among cows in their production traits may be due to differences in genetic potentiality of cows along with same changes in the herd management (Camoens *et al.,* 1976). Also, the effect on cow is due to the permanent environment whiCh transmit from record to another.

Heritability estimates: Estimates of h^2 was calculated from the analysis records of sets of paternal half sibs. The estimates were based on 3780 normal lactation records of all parities. Heritability estimates were 0.23, 0.25, 0.25, 0.29, 0.32, 0.32, 0.33, 0.34, 0.34 and 0.35 for study period (Table 4). The present results indicated that the increase of h^2 for increase CMY. While, Khattab *et al.* (1987) using another set of Friesian cattle in Egypt found that h^2 estimates for CMY increased up to the fifth months and declined thereafter. Also, Tailor and Banerjee (1996) working on 507 Surit buffaloes sired by 41 bulls, reported that h^2 estimates of monthly milk yield varied within a narrow range of 0.307 to 0.383 in the first 4 months then decreased to 0.22 in month 6.

According to the moderate h^2 estimates in the present study, it can be concluded that the genetic improvement in CMY can be achieved through selection breeding program. Estimates of phenotypic (r_p) and genetic correlation (r_g) between CMY and 305 dMY were positive and highly significant, ranged from 0.37 to 0.99 for r_p and from 0.65 to 1.00 for r_g (Table 4). Madden *et al.* (1955), Van Vleck and Henderson (1961), Khattab *et al.* (1987), Khattab and Sultan (1990), Kaya (1996) and Hussein (1996) found high phenotypic and genetic correlation between 305 dMY and part of lactation. The high phenotypic correlation between 305 dMY an CMY indicated that part of lactation can be used for evaluating the milk producing ability in cows. Also, the high genetic correlation between 305 dMY and CMY indicated that selection on the basis of part records could be accurate enough to increase genetic progress.

Prediction 305 day milk yield: Predicting 305 day milk yield from cumulative monthly milk yield by using ratio factors are presented in Table 5. Values of ratio factors for different cumulative monthly milk yield from first to the nine months ranged from 1.05 to 8.47 (Table 4). The present results are similar to those estimated by Lamb and McGilliard (1967), Ashmawy *et al*. (1985) and Abdel Glil *et al.* (1995). Vargas and Solano (1995) suggested that the ratio factors were used for efficient for the standard of milk records in the database analysed. The high genetic correlation between 305 day milk yield and cumulative monthly milk yield especially in seven months (0.98) (Table 4), indicated that sire evaluation could be possible using incomplete records extended to 305 day milk yield in order to decrease the time required for progeny test, decrease the generation interval to increase the annual genetic gain and increase the accuracy of evaluation. In addition, the early selection of cows during the extended incomplete lactation records is useful for culling the low production cows.

Estimates of partial linear and quadratic regression coefficients of prediction equations of 305 day milk yield (Y) from the cumulative monthly milk yield *(X),* where

$$Y = \mu + b_{1L}\left(X - \overline{X}\right) + b_{2Q}\left(X - X\right)^2$$

and the standard errors of regression coefficients are presented in Table 6. Linear regression coefficients are significant ($p<0.01$), while, the quadratic terms were not significant in most cases and as expected , the coefficients of regression decrease with the progress in cumulative monthly milk yield, except for 30 day milk yield. Ashmawy *et al.* (1985) and Abdel Glil *et al.* (1995) arrived at the same results using another sets of Friesian cattle in Egypt. Including the quadratic regression coefficients in the nine equations yielded non significant ($p<0.01$), negative quadratic partial regression coefficients in most cases. Ashmawy *et al.* (1985) found the differences between quadratic and linear regression coefficients are small and can be neglected.

Table 7: Coefficients of determination (R^2) of 305 day milk yield associated with the monthly cumulative (CM) records

CM	R^2
1	0.040
2	0.135
3	0.243
4	0.360
5	0.47
6	0.616
7	0.754
8	0.870
9	0.959

Table 7 show coefficients of determination (R^2) for prediction 305 day milk yield from cumulative monthly milk yield. The values of the accuracy increased speedily with the increase in the cumulative monthly milk yield (0.04 to 0.96). The present results indicate that the first seven months of lactation were considered sufficient for prediction 305 day milk yield ($R^2=0.80$). Ashmawy *et al*. (1985) using another herd of Friesian cattle in Egypt found that the seven months are the best of predictions 305 day milk yield ($R^2=$ 0.92), while, Abdel Glil *et al*. (1995) found that the first four months are the best ($R^2=0.91$).

Product moment correlation between the actual and predicted value of 305 day milk yield from cumulative monthly milk yield using regression method on the same data used in this study 0.90, while, the same coefficients between the former variable and predicted values using ratio method is 0.92. The two coefficients are significant and the differences between them is not significant. It is clear that the simplest method is the ratio factor.

Finally, sire evaluation using either ratio factors or regression extended incomplete records constructed resulted in selecting the same sires. Gaur and Raheja (1996) estimated breeding values of 27 Sahiwal sires, found that the rank correlation between part of lactation (2 months) and 305 day milk yield was 0.96. They suggested that evaluation of sires could be carried out on the basis of part lactation yield.

Acknowledgments

I would like to thank Prof. Dr. A.S. Khattab for providing the data, his helpful discussion and valuable comments.

References

Abdel Glil, M.F., A.O. Omar and A.Y. Salem, 1995. Ratio and regression factors for predicting 305-day production from part lactation milk records in Friesian cows in Egypt. Egypt. J. Appl. Sci., 10: 634-646.

Ashmawy, A.A., A.S. Khattab and M.K. Hamed, 1985. Ratio and regression factors for predicting 305-day production from part-lactation milk records in Friesian cattle in Egypt. Bulletin of Faculty of Agriculture, Cairo University, Egypt.

Asker, A.A., A.A., El-Ltriby and S.K. Fahmy, 1962. Factors affecting initial milk yield in cattle in Egypt. I.D.S.A., 25: 962-965.

Atay, O., S.M. Yener, G. Bakir and A. Kaygisiz, 1995. Estimates of genetic and phenotypic parameters of milk production characteristics of Holstein cows raised at the Ankara Ataturk foresty farm in Ankara. Turk. J. Vet. Anim. Sci., 19: 441-447.

Camoens, J.K., R.E. McDowell, L.D. Van Vleck and J.D. Rivera-Anaya, 1976. Holstein in porto rico: 1. Influence of herd, year, age and season on performance. J. Agric. Univ. Puerto Rico, 60: 526-539.

Cooper, J.B. and G.L. Hargrove, 1982. Age and month of calving adjustments of Holstein protein, milk and fat lactation yields. J. Dairy Sci., 65: 1673-1678.

Costa, C.N., J.C. Llagres, A.G. Casta and J.A. Garcia, 1982. Effect of season and age at calving on the lactation curve of Holstein Friesian cattle. I.A.B.A., 51: 34-56.

Garroni, J. and O. Verde, 1976. Part lactation and complete lactation yields in pure Holstein Friesian cattle. I.D.S.A., 40: 11-23.

Gaur, G.K. and R.L. Raheja, 1996. Genetic evaluation of Sahiwal sires based on milk yield of their daughters at earliest stage of lactation. Indian J. Vet. Res., 5: 7-13.

Harvey, W.R., 1987. User's guide for LSMLMW, mixed model leastsquares and maximum likelihood computer program. The Ohio State University, Columbus, Mimeo.

Henderson, C.R., 1953. Estimation of variance and covariance components. Biometrics, 9: 226-252.

Hussein, A.M., 1996. Age correction factors for some productive traits in a herd of Holstein Friesian cattle. M.Sc. Thesis, Faculty of Agriculture, Tanta University, Egypt.

Kassab, S.A., M.T. Flagab, M.M.S. Mabrouk, S.K. Fahmy and A.S. Khattab, 1987. Some of non genetic factors affecting lactation curve in Friesian cattle. Proceedings of the 12th International Congress for Statistics, Computer Science Social and Demographic Research, March, 1987, Cairo, Egypt.

Kaya, I., 1996. Parameter estimates for persistency of lactations and relationship of persistency with milk yield in holstein cattle. Ph.D. Thesis, Ege University, Izmir, Turkey.

Khalil, M.H., E.A. Afifi, L.H. Bedir and Z.M. Zediari, 1992. Genetic analysis of lactation traits in Egyptian buffaloes. Egypt. J. Anim. Prod., 29: 155-172.

Khattab, A.S. and K.A. Mourad, 1992. Estimation of genetic parameters and genetic trends for some milk traits in a herd of Egyptian buffaloes. Egypt. J. Anim. Prod., 29: 33-44.

Khattab, A.S. and Z.A. Sultan, 1990. Estimates of phenotypic and genetic parameters for first lactation performance in Friesian cattle in Egypt. Egypt J. Anim. Prod., 27: 147-160.

Khattab, A.S., M.A. Ibrahim and M.M. Mabrouk, 1987. Studies on part lactation milk production in Friesian cattle. J. Agric. Res. Tanta Univ., 13: 621-623.

Koley, N., G. Chowdhury and D.K. Mitra, 1981. Note on the genetic studies on milk yield, days to attain peak yield and initial milk yield in Jersey x Hariana crossbred cows at first lactation. Indian J. Anim. Sci., 51: 545-546.

Lamb, R.C. and L.D. McGilliard, 1967. Ratio factors to estimate 305-day production from lactation records in progress. J. Dairy Sci., 50: 1101-1108.

Lopes, M.A., R.S. Neiva, J. Valente, M.L. Martinez, R.D. Veiga, A.R.P. da Silva and A.F. de Freitas, 1996. [Use of gamma Lopes, type function in a study of the lactation curve in intensively managed block and white Holstein cows]. Revista Sociedade Brasileira Zootecnia Vicosa, 25: 1086-1101.

Madden, D.E., J.L. Lush and L.D. McGilliard, 1955. Relations between parts of lactations and producing ability of Holstein cows. J. Dairy Sci., 38: 1264-1271.

Mohammad, A.S.A., 1991. Effects of age of calving and other environmental factors on milk production of imported and locally born Friesian. M.Sc. Thesis, Faculty of Agriculture, Zagazig University, Egypt.

Onenec, A., 1997. A technical analysis of dairy cattle productive activities at menemen research, practice and production. M.Sc. Thesis, Ege University, Izmir, Turkey.

Qureshi, M.I., H.B.S. Bhadoria, J.P. Dubey and S.S. Tomar, 1995. Factors affecting cumulative part lactation records during first lactation for Gir cattle. J. Dairy. Foods Home Sci., 14: 189-192.

Ragab, M.T., A.S. Abdel Aziz and H.M. Mourad, 1973. Phenotypic and genetic parameters of some productive traits in a herd of Friesian cattle at tahreer provine. Egypt. J. Anim. Prod., 13: 1-19.

Soliman, A.M., A.A. Ashmawy, M.H. Khalil and A. Essl, 1989. Analysis of milk production traits of Pinzgauer cattle in Austria: I. Non-genetic factors. J. Anim. Breed. Genet., 106: 423-432.

Souza, E.M., J.C. Milagres, A. Regazzi, M. Martinez and S. Almeida, 1996. Genetic and environmental effects on milk yield in gir dairy herds. Revista Bda-Sociedade-Brasileria- daB Zootecnia, 25: 889-889.

Sudarwati, H., T. Djoharjani and M.N.M. Ibrahim, 1995. Alternative models to predict lactation curves for dairy cows. Asian-Aust. J. Anim. Sci., 8: 365-368.

Tailor, S.P. and A.K. Banerjee, 1996. First lactation partial records as an aid to selection in Surti buffaloes. Indian J. Dairy Sci., 49: 530-533.

Van Vleck, L.D. and C.R. Henderson, 1961. Estimates of genetic parameters of some functions of part lactation milk records. J. Dairy Sci., 44: 1073-1084.

Vargas, L.B. and P.C. Solano, 1995. Genetic and environmental trends for milk production in dairy cows in Costa Rica. Arch. Latinoameric. Prod. Anim., 3: 165-176.

Vij, P.K., M.S. Tantia, A.E. Nivsarkar, R.K. Vijh, P. Kumar and B.K. Joshi, 1995. Performance characteristics of Nagori cattle. Indian J. Anim. Sci., 65: 893-899.

Yener, S.M., G. Bakir and A. Kaygisiz, 1994. Milk production characteristics of Holstein cows kept at the farm of the seker factory in Ankara. Turk. J. Vet. Anim. Sci., 18: 385-389.