Genetic and Non-genetic Factors Affecting some Productive and Reproductive Traits in Holstein-Friesian Dairy Cows Raised in Egypt for the First Two Lactations

Osman M. M., Khairy M. El-Bayomi[1] and Sherif A. Moawed

Department of Animal wealth Development, Faculty of Veterinary Medicine, Suez Canal University, Ismailia, Egypt. [1] Department of Animal Wealth Development, Faculty of Veterinary Medicine, Zagazig University, Zagazig.

ABSTRACT

The present study was conducted to investigate the effects of some non-genetic factors as year and season of calving on productive and reproductive traits of dairy Holstein-Friesian cows together with the effect of genetic variation in the form of sire analysis on these traits. A total of 3460 lactation records were used for 1059 dairy cows that represented the period from 1998 to 2010. Studied traits were total milk yield (TMY), days in milk (DIM), fat yield (FY), protein yield (PY), dry period (DP), age at first calving (AFC), number of services per conception (NSC), days open (DO) and calving interval (CI). Analysis was done using sire model by Harvey (1990) software for the first and second lactations. The present herd showed high milk production around 8750 kg per lactation period. Sire effects were significant ($P \leq 0.05$) on all traits. Year and season of calving had significant effects on most of studied traits. Linear and quadratic regression coefficients of age at first calving, days open and total milk yield were significant for most of traits. Balanced and unbiased estimates for genetic evaluation could be obtained if the environmental factors fitted in the statistical models.

Keywords: Milk produccion, Dairy cattle, Productive and reproductive traits, sire model

INTRODUCTION

Milk production performance of Holstein-Friesian dairy cattle depends on genetic and environmental factors. Genetic background, climate, diseases, feeding, year and season of calving have been reported to affect milk production in tropics ***(Msanga et al, 2000 and Epaphras et al, 2004).*** Breed, age, stage of lactation and parity also influence milk production. Another important cause of variation of milk production is the effect of sires that have been used in selection programs ***(Das et***

al, 1999; Galina et al, 2001 ad Combellas et al, 2003).

Holstein-Friesian cattle breed in Egypt is considered as the best cattle breed for milk production in tropical conditions. Environmental factors such as year and season of calving and age affect its productivity and there is a need to delineate them for unbiased genetic evaluation. The objective of the present study is to investigate the effects of some environmental (non-genetic) factors including year and season of calving together with sire effect on some productive and reproductive traits in a population of Holstein-Friesian dairy cows in Egypt.

MATERIAL AND METHODS

Data collection:

Data of the present study were collected from a commercial dairy herd located at Cairo- Alexandria desert road and named Alexandria-Copenhagen Company far from Alexandria by about 76 km. Data of productive and reproductive records of Holstein Friesian cows were obtained and represented the period from 1998 to 2010. The total number of lactation records was 3460 of 1059 dairy cows which were sired by 96 sires and of 513 dams. Productive traits included were total milk yield (TMY), fat yield (FY), protein yield (PY), days in milk (DIM) and dry period (DP) while the reproductive traits were days open (DO), calving interval (CI) and age at first calving (AFC) and number of services per conception (NSC). Records involved in analysis represented the first two lactations.

Data management and limitation:

Non-normal lactation records were excluded from the analysis. Edits were performed to remove records that were incomplete, had errors in sire identifications and for sires having less than five daughters. Age at first calving was modified to be involved in the analysis per months instead of years by multiplication of the original data by 12.

Statistical models:

Data were statistically analyzed using the Least Squares Mixed Model and Maximum Likelihood (LSMLMW) computer program of ***Harvey (1990)***. Data of milk production traits were included in the analysis. Statistical sire models involved were mixed as it included two parts; the first part was fixed effect of non-genetic factors as the year of calving and season of calving on all studied traits, while the second part was random including the sire effect as genetic portion on all studied traits. For productive traits (Total milk yield, fat yield, protein yield, days in milk, and dry period), both age at first calving and days open were used as covariates in the model in the form of linear and quadratic regression analyses. On the other hand, the linear and quadratic regression analyses of reproductive traits were fitted on both age at first calving and total milk yield. The following

statistical mixed model was used for analysis of productive traits:

$$Y_{ijklmn} = \mu + S_i + Yr_j + M_k + \beta_{L1}(AFC_L) + \beta_{Q1}(AFC_L)^2 + \beta_{L2}(DO_m) + \beta_{Q2}(DO_m)^2 + e_{ijklmn}$$

Where:

Y_{ijklmn} = an observation on animal (Trait value),

μ = overall mean (mean of trait in population),

S_i = random effect of i^{th} sire (i = 1-96),

Yr_j = fixed effect of year of calving j (j=1998, 1999,…, 2010),

M_k = fixed effect of month of calving (k=January, February,…, December),

β_{L1} = linear regression coefficient for AFC,

AFC_L = covariable of age at first calving (mo),

β_{Q1} = quadratic regression coefficient for AFC,

β_{L2} = linear regression coefficient for DO,

DO_m = covariable of days open,

β_{Q2} = quadratic regression coefficient for days open,

e_{ijklmn} = Residual error and assumed to be independently, randomly distributed with mean zero.

The following statistical mixed model was used for analysis of reproductive traits:

$$Y_{ijklmn} = \mu + S_i + Yr_j + M_k + \beta_{L1}(AFC_L) + \beta_{Q1}(AFC_L)^2 + \beta_{L2}(TMY_m) + \beta_{Q2}(TMY_m)^2 + e_{ijklmn}$$

Where:

Y_{ijklmn} = an observation on animal (trait value),

μ = overall mean (mean of trait in population),

S_i = random effect of i^{th} sire (i = 1-96),

Yr_j = fixed effect of year of calving j (j=1998, 1999,…, 2010),

M_k = fixed effect of month of calving (k=January, February,…, December),

β_{L1} = linear regression coefficient for AFC ,

AFC_L = covariable of age at first calving (mo),

β_{Q1} = quadratic regression coefficient for AFC,

β_{L2} = linear regression coefficient for TMY,

TMY_m = covariable of total milk yield,

β_{Q2} = quadratic regression coefficient for total milk yield,

e_{ijklmn} = Residual error and assumed to be independently, randomly distributed with mean zero.

Further analysis for means separations was used as multiple comparisons among unequal subclass means and carried out according to ***Duncan's Multiple Range Test (1955)*** *by* ***(SAS, 2002)*** computer program. The results were considered significant at ($P \leq 0.05$).

RESULTS AND DISCUSSION

A summary statistics (unadjusted overall means, standard deviations and coefficient of variations) for productive traits of Holstein-

Friesian cows are shown in Table (1). The mean and standard deviation of each trait were estimated across two parities. The mean total milk yield was highest in the first lactation as 8954 kg with standard deviation of 3489 kg. The mean annual milk yields were higher than those estimated by ***Olesen et al (1999) and Bajwa et al (2004)*** for the same lactations. The means and their standard deviations for days in milk were measured as 398.8 ± 126.6 and 355.2 ±100.2 days for the two lactations, respectively. Days in milk were found to be 398.8 and 355.2 days within average for the two lactations, respectively. These results indicated that the current herd had high milk yield in the two lactations.

Table (2) showed the measures of unadjusted overall means, standard deviations and coefficients of variations for the reproductive traits analyzed in this study. The mean age at first calving was 33.38 month with standard deviation of 5.48 month. The mean numbers of services per conception increased from the first to second lactation. Days open were averaged as 185.9 and 155.5, respectively, while calving interval was 434.0 days. These results were near to the findings of **(Cilek and Sahin, 2009)**.These values recommended low reproductive performance of animals under high level of production.

Table (1): *Overall (unadjusted) Means, Standard Deviations (S.D.) and Coefficients of Variations (C.V.) for the Productive Studied Traits of First Two Lactations*

Lactation	Trait	Mean	S.D.	C.V. (%)
First	Days in Milk (DIM)	398.8	126.6	31.74
	Total Milk yield / kg	8954	3489	38.96
	Fat yield (kg)	268.0	100.8	37.61
	Protein yield (kg)	218.9	83.28	38.04
	Dry period	-	-	-
Second	Days in Milk (DIM)	355.2	100.2	28.21
	Total Milk yield / kg	8686	3082	35.48
	Fat yield (kg)	264.1	100.0	37.86
	Protein yield (kg)	220	84.28	38.30
	Dry period	76.71	69.11	90.09
	Peak milk yield (days)	75.97	52.23	68.75
	Dry period	78.05	68.19	87.36

Table (2): *Overall (unadjusted) Means, Standard Deviations and Coefficients of Variations for the Reproductive Studied Traits of First Two Lactations*

Lactation	Trait	Mean	S.D.	C.V. (%)
First	Age at first calving (month)	33.38	5.48	16.41
	Services per conception (number)	2.00	1.77	88.5
	Days open	185.9	131.7	70.8
	Calving interval	-	-	-
Second	Services per conception	3.16	2.15	68.0
	Days open	155.5	120.0	77.17
	Calving interval	434.0	111.6	25.58

Tables (3-6) represent the effect of fixed (non-genetic) and random factors on the studied productive and reproductive traits for the data of the first two lactations. The fixed effects were the year and season of calving, and the random effect was included in the model as sire effect for genetic evaluation of the dairy farm. In addition, the model contained the linear and quadratic regression of productive traits on age at first calving and days open, and the linear and quadratic regression of reproductive traits on age at first calving and total milk. In other words, age at first calving, days open and total milk were fitted as covariates. Tables (3-6) obtained as the result of the mixed model least squares analysis of variance of ***Harvey (1990)***.

Year of calving had a significant effect ($P \leq 0.05$) on all studied productive traits except for days in milk, total milk yield and dry period in second lactation. Also, year of calving had a significant ($P \leq 0.05$) effect on reproductive traits except for number of services per conception in first lactation. Similar findings were found by ***Mohamed, 1987; Djemali and Berger, 1992 and Lee et al, 2003***. Season of calving had a significant ($P \leq 0.05$) effect on all studied traits except for fat yield, dry period and days open in second lactation and number of services per conception in two lactations. As shown in tables (3, 4, 5 and 6) sire had a significant ($P \leq 0.05$) effect on all studied traits that indicate genetic variations and possibility of genetic improvement of this herd together with interest of environment.

Linear regression coefficients on age at first calving were significant for total milk yield, fat yield and protein yield in second lactation, while the quadratic coefficients on the same covariate were non-significant for all studied traits. Linear regression coefficients on

days open were significant for all productive traits, while the quadratic coefficients were significant for all traits except for total milk yield in 1st lactation and dry period in second lactation. In addition, linear and quadratic regression coefficients on total milk yield were significant for most of reproductive traits as the finding of ***Scott et al (1996)***.

Table (3): *Combined Least Squares Analysis of Variances for the Studied Factors Affecting Productive Traits for the First Lactation*

Source of variation	D.F.	Mean squares			
		DIM	TMY	Fat yield	Protein yield
Sire	95	7305*	14793976**	18848.4**	10528.13**
Year of calving	10	10202*	30849666**	34218.7**	24716.13**
Season of calving	11	2860.99*	8796167*	3473.41*	2984.86*
Regression on AFC (linear)	1	4283.78	4289472	14590.0	3465.66
Regression on AFC (quadratic)	1	4319.28	28827	12878.84	8325.74
Regression on DO (linear)	1	4926217**	1093836663**	765627.3**	519762.9**
Regression on DO (quadratic)	1	153709**	6265382	165832.86**	108726.58**
Error	938	5673.66	8157419	7422.135	5102.76

Table (4): *Combined Least Squares Analysis of Variances for the Studied Factors Affecting Productive Traits for the Second Lactation*

Source of variation	D.F.	Mean squares				
		DIM	TMY	Fat yield	Prot. Yield	Dry period
Sire	95	8834**	17777653**	22115**	13810**	10190**
Year of calving	10	6945	6613525	24344**	18067**	1534
Season of calving	11	14805**	13445018*	12144	10709*	1694
Regression on AFC (linear)	1	13209	67875286**	65570**	55361**	5533
Regression on AFC (quadratic)	1	20240	1461533	20.06	1998	177.6
Regression on DO (linear)	1	1823910**	565600091**	500429**	370409**	86451**
Regression on DO (quadratic)	1	199931**	139053197**	187566**	117437**	5.641
Error	938	6082	7228868	7358	5127	3903

Table (5): *Combined Least Squares Analysis of Variances for the Studied Factors Affecting Reproductive Traits for the First Lactation*

Source of variation	D.F.	Mean squares	
		S/C	Days open
Sire	95	10.865**	15393.2**
Year of calving	10	2.875	107407.1**
Season of calving	11	3.099	39115.3**
Regression on AFC (linear)	1	1.036	133.15
Regression on AFC (quadratic)	1	0.999	566.07
Regression on TMY (linear)	1	12.525**	1868934**
Regression on TMY (quadratic)	1	17.17**	396828.4**
Error	938	2.238	10693.5

Table (6): *Combined Least Squares Analysis of Variances for the Studied Factors Affecting Reproductive Traits for the Second Lactation*

Source of variation	D.F.	Mean squares		
		S/C	Days open	Calving interval
Sire	95	10.77**	15130*	16100**
Year of calving	10	8.995**	59774**	64686**
Season of calving	11	3.418	15599	28255**
Regression on AFC (linear)	1	15.16*	76.17	11742
Regression on AFC (quadratic)	1	1.961	1907	36481
Regression on TMY (linear)	1	11.01	872612**	7732
Regression on TMY (quadratic)	1	48.14**	698614**	77418**
Error	938	3.822	11512	10713

As given in Tables (7, 8, 9 and 10), the adjusted means and their standard errors were calculated for productive and reproductive traits that showed the effect of year of calving (from 1998 to 2010), season of calving (from January to December) as well as the linear and quadratic regression coefficients of the productive traits on age at first calving, days open and total milk yield. The overall adjusted means and their standard errors of total milk yield were 8783±246.5 and 8831±294, for the first two lactations, respectively. Similar results were reported by ***Tekerli and Gundogan (2005)***. In general, total milk yield was highest in later years of calving in all lactation compared with early years of calving. Little seasonal variations were observed for milk production, where the yield was higher from May to August compared with other months of the year.The variation of milk yield from one year to another, and from parity to another could be attributed to changes in herd size, age of animals and good management practices from lactation to another. This conclusion agrees with the

finding of ***Rege (1991); Atil et al (2001) and Amino et al (2007)***. The overall adjusted means and their standard errors of days in milk were 401.8±5.13 and 370.53±6.08 for the first two lactations, respectively. These results were lower than those estimated by ***Bajwa et al (2004)***. The higher days in milk in the original farm data in the first lactation was the cause of increasing the value of its mean especially that we found some cows had days in milk greater than 600 days.

The overall adjusted means and their standard errors of fat and protein yields were 272.58±9.16 and 267.8±10.6 for fat yield, and were 219.96±6.69 and 224.9±8.3 for protein yield 1st and 2nd lactations, respectively. This result showed that these traits had the same trend as occurred total milk yield. The estimate for dry period was 75.01±7.08 for the 2nd lactation. It was clear that dry period increased with calving age of cows. Similar results were reported recently by ***M'hamdi et al (2012)*** on Holstein cows. Absence of seasonal variations in dry period could be attributed to management and the fixed ration allover the year round.On the other hand, adjusted means and their standard errors of the number of services per conception were 2.22±0.22 and 2.75±0.23, respectively. As shown, the number of services required increased as the age of cow increased; this may be due to reproductive inefficiency of cows in the farm which is antagonistic with milk yield as seen from the results. Similarly, the adjusted means of days open were higher than the ideal values and may indicate reproductive problems in the farm. The estimates of days open were 192.48±7.45 and 154.27±7.79, for the first and second lactations, respectively. The result of the present study is in accordance with the finding of ***Ibrahim et al (2002)***, but higher than the findings of ***Ojango (2000)*** who found that the averages of days open were 127, 112, 115 and 104 days for the same lactations, respectively. The result showed that the adjusted mean of age at first calving was 29.75±0.40 month for the herd. Ages at first calving were ranged from 25.5 to 34.6 months across all years of calving. The variation in the values of age at first calving may be the cause of its significant effect on most of productive and reproductive traits specially that AFC was used as covariate in all models.

The adjusted mean ± standard error of calving interval was 442.91±8.26, for the second, lactation. The present study showed the significant effect of total milk yield as covariate on calving interval. These estimates of CI were near the results obtained by ***Ibrahim et al (2002)*** who found CI means as 358.6, 430, 432, and 462 for the first five lactations.

Table (7): *Adjusted Least Square Means and Standard Errors of the Fixed Effects and Covariates on Productive Traits for the First Lactation*

Effects			Adjusted means ± standard errors				
Independent variable			No	DIM	TMY	Fat yield	Protein yield
Overall mean		**-**	**1059**	**401.8±5.13**	**8783±246.5**	**272.58±9.16**	**219.96±6.69**
Year of calving		1998	17	395.3^{cd}±19.5	9140^{ab}±755.9	229.61^{d}±23.42	189.89^{de}±19.09
		1999	17	396.1^{bc}±20.3	8309^{b}±783.3	279.52^{abc}±24.22	203.46^{de}±19.76
		2000	23	412.7^{ab}±17.1	8293^{b}±665.3	305.98^{ab}±20.76	238.26^{abc}±16.84
		2001	37	359.8^{d}±14.5	6986^{b}±570.2	231.32^{c}±18.01	188.63^{e}±14.50
		2002	68	408.1^{ab}±11.5	8598^{b}±461.2	270.92^{bc}±14.90	227.75^{abc}±11.83
		2003	143	412.2^{ab}±8.60	9137^{b}±358.6	261.52^{c}±12.06	222.94^{bcd}±9.34
		2004	149	412.9^{ab}±8.30	9136^{b}±350.0	260.98^{c}±11.83	206.59^{cd}±9.13
		2005	142	423.3^{a}±9.30	9103^{b}±382.8	273.44^{abc}±12.72	224.95^{bcd}±9.92
		2006	207	398.3^{abc}±8.60	9687^{a}±361.1	298.38^{abc}±12.13	247.82^{ab}±9.40
		2007	199	401.6^{ab}±7.60	8301^{b}±326.6	262.11^{c}±11.21	210.25^{cd}±8.57
		2008	57	399.5^{abc}±12.5	9923^{a}±497.2	324.60^{a}±15.92	258.97^{a}±12.71
Season of calving		January	121	402.5^{cde} ±8.80	8831^{ab} ±365.5	276.03^{a} ±12.25	222.25^{abc} ±9.50
		February	109	400.8^{cde} ±8.90	8708^{ab} ±371.2	272.90^{ab} ±12.41	217.04^{bc} ±9.64
		March	94	392.4^{de} ±9.40	8681^{ab} ±389.2	271.34^{ab} ±12.90	227.08^{a} ±10.08
		April	94	410.3^{a} ±9.30	8992^{ab} ±384.7	274.33^{ab} ±12.78	225.63^{a} ±9.97
		Mai	66	390.9^{e} ±10.7	8562^{bc} ±432.2	275.76^{ab} ±12.09	222.36^{ab} ±11.12
		June	65	398.3^{cde} ±10.6	8407^{bc} ±428.6	273.08^{ab} ±13.99	222.16^{abc}±11.03
		July	83	404.7^{abcd} ±9.9	8892^{ab} ±407.1	266.67^{ab} ±13.39	217.39^{abc}±10.51
		August	78	405.5^{abc} ±10.1	9109^{a} ±410.5	271.88^{ab} ±13.49	217.59^{abc}±10.59
		September	92	397.1^{cde} ±9.50	8988^{ab} ±393.1	274.55^{ab} ±13.00	222.77^{a} ±10.17
		October	70	404.2^{bcd} ±10.8	8716^{ab} ±436.4	262.14^{b} ±14.21	211.22^{bc} ±11.22
		November	85	404.7^{abcd}±9.90	8126^{c} ±406.7	264.42^{ab} ±13.38	206.83^{c} ±10.50
		December	102	409.9^{ab} ±9.20	9385^{a} ±380.6	287.87^{ab} ±12.66	227.18^{a} ±9.87
Regression coefficients	**AFCL**			0.439±0.505	-13.16±19.16	-0.810±0.578	-0.395±0.479
	AFC Q			0.047±0.054	0.121±2.041	0.081±0.061	0.065±0.051
	DO L			0.841^{**}±0.028	12.53^{**}±1.082	0.331^{**}±0.032	0.273^{**}±0.027
	DO Q			-0.0004^{**}±0.00	-0.0031±0.003	-0.0005^{**}±0.000	-0.0004^{**}±0.000

Table (8): *Adjusted Least Square Means and Standard Errors of the Fixed Effects and Covariates on Reproductive Traits for the First Lactation*

Effects				Adjusted means ± standard errors		
Independent variable			No	SC	DO	AFC-month
Overall mean		-	**1059**	**2.22±0.22**	**192.48±7.45**	**29.75±0.40**
Year of calving		1998	17	2.65^{a}±0.43	188.09^{bc}±26.97	31.38^{bcd}±1.28
		1999	17	2.38^{a}±0.45	241.20^{bc}±27.91	34.60^{a}±1.31
		2000	23	2.43^{a}±0.39	205.47^{bc}±23.61	31.91^{bc}±1.13
		2001	37	1.93^{a}±0.35	297.27^{b}±19.76	32.02^{ab}±0.95
		2002	68	1.92^{a}±0.30	247.08^{bc}±15.79	29.69^{cde}±0.77
		2003	143	2.10^{a}±0.26	186.25^{cd}±12.07	30.62^{bcd}±0.61
		2004	149	1.91^{a}±0.26	177.25^{cd}±11.66	29.76^{bcd}±0.56
		2005	142	2.32^{a}±0.27	166.04^{de}±12.91	28.41^{def}±0.64
		2006	207	2.49^{a}±0.26	167.34^{cd}±12.24	25.53^{f}±0.60
		2007	199	2.15^{a}±0.25	145.95^{e}±10.97	26.69^{f}±0.53
		2008	57	2.19^{a}±0.31	95.31^{a}±16.86	26.73^{ef}±0.82
Season of calving		January	121	2.37^{a}±0.26	187.96^{bc}±12.18	30.19^{a}±0.61
		February	109	2.09^{a}±0.26	212.93^{ab}±12.43	30.39^{a}±0.62
		March	94	1.91^{a}±0.27	213.94^{ab}±13.21	29.64^{a}±0.65
		April	94	2.02^{a}±0.27	228.60^{a}±13.06	30.38^{a}±0.65
		Mai	66	2.14^{a}±0.29	204.66^{ab}±14.93	29.94^{a}±0.73
		June	65	2.11^{a}±0.29	222.65^{ab}±14.74	29.76^{a}±0.72
		July	83	2.23^{a}±0.28	184.98^{cd}±13.83	28.49^{a}±0.67
		August	78	2.48^{a}±0.28	155.83^{d}±13.94	28.97^{a}±0.68
		September	92	2.46^{a}±0.27	175.30^{cd}±13.31	29.33^{a}±0.65
		October	70	2.44^{a}±0.29	179.08^{cd}±14.97	29.76^{a}±0.73
		November	85	2.03^{a}±0.28	170.59^{cd}±13.93	30.45^{a}±0.68
		December	102	2.40^{a}±0.27	173.21^{cd}±12.83	29.77^{a}±0.64
Regression coefficients	**AFC L**			0.007±0.010	0.077±0.694	No regression
	AFC Q			0.0007±0.001	-0.016±0.074	No regression
	TMY L			0.0000**±00000	0.014**±0.001	No regression
	TMY Q			0.0000**±0.0000	0.000**±0.000	No regression

Table (9): *Adjusted Least Square Means and Standard Errors of the Fixed Effects and Covariates on Productive Traits of the Second Lactation*

Effects				**Adjusted means ± standard errors**				
Independent variable			**No**	**DIM**	**TMY**	**Fat yield**	**Protein yield**	**Dry period**
Overall mean		-	**1059**	**370.53±6.08**	**8831±294**	**267.8±10.6**	**224.9±8.3**	**75.01±7.08**
Year of calving		1999	16	361.14^{a}±21.20	8908^{a}±759	284.7^{ab}±24.7	217.9^{abc}±20.4	74.37^{a}±17.74
		2000	13	358.29^{a}±23.85	7736^{a}±847	258.6^{abc}±27.5	214.2^{bc}±22.7	65.08^{a}±19.78
		2001	26	394.57^{a}±17.07	8252^{a}±623	225.7^{c}±20.5	211.0^{bc}±16.8	63.90^{a}±14.61
		2002	27	392.09^{a}±17.13	9106^{a}±625	264.3^{abc}±20.5	220.3^{abc}±16.9	80.63^{a}±14.65
		2003	61	374.42^{a}±11.91	8655^{a}±459	241.3^{bc}±15.4	216.8^{abc}±12.5	79.96^{a}±10.84
		2004	127	379.06^{a}±9.72	8915^{a}±393	242.7^{bc}±13.5	193.5^{c}±10.8	72.88^{a}±9.33
		2005	170	374.24^{a}±8.58	9303^{a}±360	267.4^{abc}±12.5	235.5^{ab}±9.9	78.81^{a}±8.58
		2006	134	365.57^{a}±9.67	9427^{a}±392	291.9^{ab}±13.4	248.0^{a}±10.8	70.52^{a}±9.30
		2007	213	357.78^{a}±8.95	8803^{a}±371	280.5^{abc}±12.8	227.0^{abc}±10.2	82.14^{a}±8.82
		2008	205	370.21^{a}±8.09	9070^{a}±346	287.1^{ab}±12.1	235.8^{a}±9.6	77.31^{a}±8.27
		2009	67	348.46^{a}±12.07	8962^{a}±464	302.6^{a}±15.6	254.2^{a}±12.7	79.56^{a}±10.95
Season of calving		January	108	372.58^{bcd}±9.93	8835^{ab}±399	259.4^{a}±13.6	215.3^{bc}±10.9	66.91^{a}±9.47
		February	99	378.20^{abcd}±9.98	8759^{ab}±401	254.4^{a}±13.7	211.1^{bc}±11.0	81.00^{a}±9.50
		March	68	389.88^{ab}±11.53	8913^{ab}±447	275.4^{a}±15.1	230.9^{ab}±12.2	77.59^{a}±10.57
		April	50	391.59^{a}±12.98	9567^{a}±492	282.7^{a}±16.4	241.3^{ab}±13.4	70.04^{a}±11.60
		Mai	47	380.82^{abcd}±13.39	9434^{ab}±505	279.8^{a}±16.8	235.8^{ab}±13.7	83.09^{a}±11.89
		June	64	383.51^{abc}±11.83	9566^{a}±457	293.4^{a}±15.4	247.7^{a}±12.5	71.05^{a}±10.78
		July	74	366.16^{cde}±10.88	8669^{ab}±428	261.6^{a}±14.5	220.8^{bc}±11.7	69.60^{a}±10.12
		August	90	355.89^{de}±10.41	8028^{b}±413	242.6^{a}±14.1	200.8^{c}±11.3	75.81^{a}±9.79
		September	125	370.45^{bcd}±9.34	8337^{b}±382	258.7^{a}±13.1	219.4^{bc}±10.5	77.07^{a}±9.08
		October	128	354.23^{de}±9.01	8662^{b}±372	270.1^{a}±12.8	224.9^{bc}±10.3	78.22^{a}±8.86
		November	114	357.80^{de}±9.59	8579^{b}±389	263.2^{a}±13.3	225.0^{bc}±10.7	73.39^{a}±9.25
		December	92	345.25^{e}±10.17	8620^{b}±406	272.3^{a}±13.8	226.0^{abc}±11.2	76.41^{a}±9.63
Regression coefficients	**AFCL**			-0.768±0.522	-1.71±0.57	-1.6**±0.48	0.497±0.417	0.497±0.417
	AFCQ			-0.102±0.056	0.003±0.061	-0.032±0.05	- 0.009±0.004	- 0.009±0.004
	DO L			0.616**±0.0355	0.323**±0.039	0.277**±0.033	0.134**±0.028	0.134**±0.028
	DO Q			-0.0005** ±0.0009	-0.0005** ±0.0001	-0.0004** ±0.00008	- 0.002±0.007	- 0.002±0.007

Table (10): *Adjusted Least Square Means and Standard Errors of the Fixed Effects and Covariates on Reproductive Traits for the Second Lactation*

Independent variable			No	Adjusted means ± standard errors		
				Services/conception	Days open	Calving interval
Overall mean		**-**	**1059**	**2.75±0.23**	**154.27±7.79**	**442.91±8.26**
Year of calving		1999	16	2.07^{c}±0.56	143.89^{bcd}±28.98	447.92^{ab}±28.17
		2000	13	2.18^{c}±0.62	140.50^{bcd}±32.72	435.65^{bcd}±31.75
		2001	26	2.04^{c}±0.46	241.82^{a}±23.14	497.03^{d}±22.59
		2002	27	2.54^{c}±0.46	190.63^{ab}±23.19	480.72^{a}±22.64
		2003	61	2.98^{abc}±0.35	164.45^{abc}±16.08	491.37^{a}±15.88
		2004	127	3.40^{ab}±0.29	184.94^{ab}±12.92	447.29^{abc}±12.93
		2005	170	3.47^{a}±0.28	158.69^{bc}±11.63	433.44^{cd}±11.73
		2006	134	2.72^{abc}±0.29	128.38^{cd}±13.04	387.21^{cd}±13.04
		2007	213	2.95^{abc}±0.29	104.16^{d}±12.34	434.99^{bcd}±12.39
		2008	205	2.87^{abc}±0.27	131.63^{bcd}±10.65	399.14^{cd}±10.84
		2009	67	3.03^{ab}±0.35	107.82^{cd}±16.12	417.19^{cd}±15.93
Season of calving		January	108	2.55^{a}±0.30	156.56^{a}±13.25	433.88^{cd}±13.23
		February	99	2.64^{a}±0.31	153.22^{a}±13.43	436.69^{cd}±13.40
		March	68	2.69^{a}±0.34	178.35^{a}±15.57	443.23^{bcd}±15.41
		April	50	2.84^{a}±0.37	160.68^{a}±17.66	427.85^{cd}±17.38
		Mai	47	2.32^{a}±0.38	147.33^{a}±18.18	424.91^{cd}±17.87
		June	64	2.96^{a}±0.34	177.54^{a}±16.02	420.68^{d}±15.83
		July	74	3.18^{a}±0.32	165.99^{a}±14.67	422.04^{cd}±14.56
		August	90	2.95^{a}±0.31	156.03^{a}±14.06	452.14^{abcd}±13.99
		September	125	2.74^{a}±0.29	135.49^{a}±12.43	478.24^{a}±12.47
		October	128	2.53^{a}±0.29	144.11^{a}±12.06	469.72^{ab}±12.13
		November	114	2.89^{a}±0.29	137.36^{a}±12.87	448.03^{bcd}±12.88
		December	92	2.74^{a}±0.31	138.52^{a}±13.55	457.45^{abc}±13.51
Regression coefficients	**AFC L**			0.026^{*}±0.013	-0.058±0.719	0.73±0.69
	AFC Q			0.001±0.0014	-0.031±0.076	-0.136±0.074
	TMY L			0.00004±0.00002	0.011^{**}±0.001	0.001±0.001
	TMYQ			0.00^{**}±0.000	0.0000^{**}±0.000	0.00^{**}±0.00

The present study indicated that Holstein dairy farming system in commercial herd in Egypt can show high milk production under adequate management. Existing evidence suggesting that high production is positively correlated to later lactations. However, low reproductive performance was observed in the current herd under the high yielding levels. The significant effect of non-genetic factors such as year and month of calving was observed for most of studied traits. Involving of these fixed effects in the statistical model could be resulted in more accurate and reasonable estimates.

REFERENCES

Amimo J.O., R.O. Mosi, J.W. Wakhungu, T.K. Masaya and B.O. Inyangala (2007): Phenotypic and genetic parameters of reproductive traits for Ayrshire cattle on large-scale farms in Kenya. Livestock Research Rural Development, 18 (10).

Atil H., A. S. Khattab and C. Yakupoglu (2001): Genetic analysis for ilk traits in different herds of Holstein Frisian cattle in Turkey. Journal of Biological Science 1(8): 737-741.

Bajwa, I.R., M.S. khan, M.A. khan and K.Z. Gondal (2004): Environmental factors affecting milk yield and lactation length in Sahiwal cattle. Pakistan Vet. J., 24 (1): 23-27.

Cilek, S. and S. Sahin (2009): Estimation of some genetic parameters (heritability and repeatability) for milk yield in the Anatolian population of Holstein cows. Archiva Zootechnica 12:1, 57- 64.

Combellas, J., M. Tesorero, and L. Gabaldon (2003): Effect of calf stimulation during milking on milk production and fat content of Bos indicus×Bos Taurus cows. Livest. Prod. Sci. 79 (2–3): 227–232.

Das, S.M., H. Wiktorsson and M. Forsberg (1999): Effect of calf management and level of feed supplementation on milk production and calf growth of zebu and crossbreed cattle in the semi-arid tropics. Livest. Prod. Sci. 59, 67–75.

Djemali, M., and P.J. Berger (1981): Yield and reproduction characteristics of Friesian cattle under North African conditions. J. Dairy Sci. 75:3568-3575.

Duncan, D. B. (1955): Multiple range and multiple F tests, Biometrics, 11, 1-42.

Epaphras, A., E.D. Karimuribo and S.N. Msellem (2004): Effect of season and parity on lactation of crossbred Ayrshire cows reared under coastal tropical climate in Tanzania. Livest. Res. Rural. Dev. 6 (16) Online: URL: http://www.cipav.org.co/lrrd/lrrd16/6/epap16042.

Galina, C.S., I. Rubio, H. Basurto and A. Orhuela (2001): Consequences of different suckling systems for reproductive activity and productivity of cattle in tropical conditions. Appl. Anim. Behav. Sci. 72, 255–262.

Harvey, W.R. (1990): User's guide for LSMLMW, mixed model least squares and maximum likelihood computer program. PC-2 version 2, Ohio state Univ., Columbus (Mimeograph), USA.

Ibrahim, Z.M.K., A.I., Haider, N.A. Shalaby and M.A.Z. Alemam (2002): evaluation of productive and reproductive performance of Friesian cows raised in Egypt. Proc., 1st Sc. Conf. Anim. And Fish Prod. Mansoura 24 and 25 September.

Lee, D.H., K.J. Han, and B.H. Park (2003): Genetic relationship between milk yields, calving ease

and days open at first lactation of Holstein cows in Korea. Interbull Bull. 31:122–129.

M'hamdi, N., R. Aloulou, S.K. Bouallegue and Ben M. Hamouda (2010): Phenotypic and genetic parameters of reproductive traits in Tunisian Holstein cows. Biotechnology in Animal Husbandry, 26 (5-6): 297-307.

Mohamed, S.S. (1987): Milk and calf production as affected by calving interval and service period in purebred and crossbred Friesian cows in Egypt. M. Sc. Thesis, Faculty of Agriculture, Ain Shams University, Cairo, Egypt.

Msanga, Y.N., M.J. Bryant, I.B. Rutam, F.N. Minja and L. Zylstra (2000): Effect of environmental factors and of the proportion of Holstein blood on the milk yield and lactation length of crossbred dairy cattle on smallholder farms in north-east Tanzania. Trop. Anim. Health Prod. 32 (1), 23–31.

Ojango, J.M. (2000): Performance of Holstein-Friesian cattle in Kenya and the potential for genetic improvement using international breeding values; PhD thesis. Wye University College, university of London.

Olesen I., E. Lindhardt and M. Ebbesvik (1999): Effects of calving season and sire's breeding value in a dairy herd during conversion to ecological milk production. Livestock Production Science. 61: 201–211.

Rege, J.E.O. (1991): Genetic analysis of reproductive and productive performance of Friesian cattle in Kenya; Journal Animal Breeding and Genetics 108: 412-432.

SAS® 9.1.3 (2002): Fifth Edition, SAS Institute Inc., Cary, NC, USA ISBN 978-1-59994-098-4.

Scott, T.A., B. Yandell, L. Zepeda, R.D. Shaver, and T.R. Smith (1996): Use of lactation curves for analysis of milk production data. J. Dairy Sci. 79:1885-1894.

Tekerli, M., and M. Gundogan (2005): Effect of certain factors on productive and reproductive efficiency traits and phenotypic relationships among these traits and repeatabilities in west Anatolian Holsteins. Turk J. Vet. Anim. Sci. 29: 17-22.

الملخص العربي

العوامل الوراثية والغير وراثية التى تؤثر على بعض الصفات الانتاجية والتناسلية لأبقار الهولشتين-فريزيان المرباة فى مصر للموسمين الأول والثانى

محمد منصور عثمان ، خيرى محمد البيومى[1] ، شريف عبد الرحمن معوض

قسم تنمية الثروة الحيوانية ، كلية الطب البيطرى ، جامعة قناة السويس ، الإسماعيلية ، مصر
قسم تنمية الثروة الحيوانية ، كلية الطب البيطرى ، جامعة الزقازيق، الزقازيق [1]

أجريت الدراسة الحالية بهدف معرفة تأثير بعض العوامل الغير وراثية مثل سنة وموسم الولادة على الصفات الانتاجية والتناسلية لأبقار حليب الهولشتين – فريزيان بالاضافة الى تأثير التباين الوراثى على شكل تحليل تأثير الاباء على الصفات المدروسة. استخدم فى الدراسة عدد ٣٤٦٠ سجل للألبان كانت ممثلة ل ١٠٥٩ بقرة فى الفترة من ١٩٩٨ الى ٢٠١٠. كانت الصفات المدروسة هى انتاج اللبن الكلى ، عدد أيام الحليب ،كمية الدهن ، كمية البروتين فى اللبن ، فترة الجفاف ، العمر عند أول ولادة ، عدد التلقيحات اللازمة لحدوث اخصاب ، طول الفترة المفتوحة والفترة بين ولادتين. تم اجراء التحليل الاحصائى باستخدام نموذج الاباء بالحزمة الاحصائية Harvey لعام ١٩٩٠ وذلك للموسمين الأول والثانى. أظهر القطيع الحالى انتاجا مرتفعا من اللبن بمعدل ٨٧٥٠ كجم لموسم الحليب. كانت تأثيرات الاباء معنوية على جميع الصفات. كان لسنة وموسم الولادة تأثيرات معنوية على معظم الصفات المدروسة. كانت معاملات الانحدار الخطى والتربيعى للعمرعند أول ولادة ، طول الفترة المفتوحة و انتاج اللبن الكلى معنوية لمعظم الصفات. يمكن الحصول على تقديرات متوازنة وغير متحيزة عند التقييم الوراثى للمزرعة اذا تم ادراج العوامل البيئية فى النموذج الاحصائى.