J.Animal and Poultry Prod., Mansoura Univ., Vol. 7 (7): 279 - 285, 2016

Genetic Evaluation for Some Productive and Reproductive Traits by Using Animal Model in A Commercial Friesian Herd in Egypt

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ABSTRACT

Data used in this investigation were collected from 4370 records for 874 purebred Friesian cows' daughters of 44 sires from 1985 to 2003, which belong to Shobratana Animal Production Society, located in the north part of Delta region near Tanta city in Egypt. Variance and covariance components for 305 day milk yield (305- dMY, kg), lactation length (LL, day), dry period (DP, day), days open (DO, day) and calving interval, (CI, day) were estimated with REML using an animal model (Boldman, 1955), that included the fixed effects of month and year of calving and parity of cow. Random effects were animal, direct and maternal genetic effects, maternal permanent environmental effect and random effect.Overall means of (305-dMY), LL, DP, DO and CI were 4897 kg, 327 day, 120 day, 66.3 day and 401.16 day. Month and year of calving were highly significant effect ($P<0.01$) for all studied traits. Direct heritability (h^2_a) of the mentioned traits was 0.38, 0.13, 0.14, 0.11 and 0.16, respectively. Heritabilities of maternal effects (h^2_m) of (305-dMY) (0.13), LL (0.18), DP (0.23), DO (0.14) and CI (0.21), respectively. Estimates of direct-maternal genetic correlations in all traits studied ranging from -0.60 to 0.74. Genetic correlations among different studied traits ranged from -0.80 to 1.00 while the phenotypic correlations among investigated traits were positive, ranging from 0.07 to 0.99.Range of predicted breeding value (PBV's) of sires were 462 kg, 1.05 d, 0.24 d, 5.93 d and 2.26 d, for 305dMY, LL, DP, DO and CI, respectively. PBV's of cows of the mentioned traits was 1123 kg, 2.92 d, 1.64 d, 5.93 d and 2.92 d respectively. Corresponding PBV's of dams for the above same traits were 510 kg, 1.42 d, 0.80 d, 7.20 d and 3.00 d, respectively. Accuracy of (PBV's) ranged from 38 to 88, 73 to 88 and 39 to 89% for sires, cows and dams, respectively; indicating the genetic improvement could be attained through any bath of them. Estimates of temporary environmental variance as a proportion of phenotypic variance for LL, DP, DO and CI ranged from 35 to 71% indicating the improvement in these traits could be achieved by improving for these temporary factors.

Keywords: Direct and maternal genetic parameters, breeding value, Friesian cows and Animal model.

INTRODUCTION

Friesian cattle are the most popular dairy cattle and also represent a major source of red meat in Egypt. The success of selection for milk production has contributed to the domination of the Friesian breed around the world. In Egypt, dairy industry represents 35% of the total animal production sector. During the last two decades, considerable emphasis had been placed upon the importance of Friesian cattle in Egypt for milk production, accordingly the number of large Friesian herds had increased either in the governmental or commercial farms through importation from Europe and USA (Shalaby *et al*., 2001). Main reasons of low productivity of farm animals are; non-descript breed, poor management, lack of nutrition, lack of resources, low inputs; inadequate artificial insemination service and diseases. These causes lead to low average milk production, late age at first calving, delayed conception, impaired fertility, long calving intervals (Khan *et al*., 2008). The performance of Holstein-Friesian cattle for milk production affected by different factors such as animal genetic merit, calving season, administrative, feeding and diseases had reported by (Epaphras *et al*., 2004). Aziz *et al*., (2014) estimate the heritability for lactation milk yield (0.26), lactation length (0.10), dry period (0.06), calving interval (0.07), gestation length (0.06) and open days (0.03). They added that the genetic and phenotypic correlations between milk yield and fertility traits were positive except between LL and DP. Sharma, (1982), Roy *et al*., (1985) and Abubakar *et al*., (1987) reported that the reproductive traits could improved by sire selection. Calving interval is one of the most important measures of reproductive efficiency in dairy cattle, early postpartum breeding in dairy animals, high fertility, short dry period and early maturity are resulted in more calves and high milk yield per unit of time throughout the herd life (Britt, 1975). With the help of heritability one can predict the breeding value of the individual. The magnitude of heritability dictates the choice of the selection method and breeding system (Paul *et al*., 2003). Addition, a goal of dairy cattle breeder is to increase genetic merit of milk production to determine the effectiveness of breeding programs. Falconer and Mackay, (1996) estimation of h^2 for any trait can be calculated from sire model or animal model. Genetic variance might be underestimated if selection intensity is higher for males than for females because analyses with sire models accounted only for genetic variance of sires (Albuquerque *et al*., 1995). Animal model take into account differential selection of males and females and might provide more accurate estimates of parameters than do sire model. Gutierrez *et al*., (1995) with Spanish Holstein Friesian cows, comparison between sire and animal model, suggested that a sire model based estimating procedure for genetic parameters may be preferred when a small number of individuals, little pedigree information and highly unbalanced distribution of effects. Also, the same authors concluded that the cheapest in terms of computing costs was based on a sire model and the most expensive on an animal model.

The objectives of the present study were estimate some non-genetic factors affecting some productive (305-dMY, LL and DP) and reproductive traits (DO and CI) and estimate the genetic and phenotypic parameters and breeding values for these traits by using Animal Model.

MATERIALS AND METHODS

Data and managements:

Data used in this investigation were collected from 4370 records relevant to 874 purebred Friesian cows which belong to Shobratana Animal Production Society, located in the North Part of Delta region near Tanta city in Egypt. These cows were daughters of 44 sires. The records used covered the period from 1985 to 2003. The following five productive and reproductive traits were analyzed, 305 day milk yield (305-dMY, kg), lactation length (LL, day), dry period (DP, day), days open (DO, day) and calving interval (CI, day). Animals were housed free in shaded open yards covered with 3.5 - 4 meters high roofs, grouped according to their average daily milk yield and fed adlibitum on berseem (Trifolium alexandrinum) and rice straw in addition concentrates feed mixture from December to April (green season) and mature cows fed daily on ration consisting of cotton seed cakes, barley wheat and rice bran (not less than 18% protein from May to November (dry season). Mineral mixture bricks were offered adlibtium as lick salt in front animals, and on balanced ration of a concentrates according to their production and weigh. Rice straw and water were offered adlibitum. Limited amount clover hay when available. Cows were artificially inseminated during heat, which occurred after 60 days postpartum using imported frozen semen from USA and Canada. Heifers were artificially inseminated for the first time in the first two heats once they attained 350 kg or 18-22 months of live body weight. Pregnancy diagnoses were carried out routinely at 60 days after service by rectal palpation. If conception did not occur or the cows were seen in estrus, the cows were inseminated again. The cows were machine milked three times a day at 04.00h, 12.00 and 19.00h. The calves born were artificially suckled after calving to weaning excluding colostrums period.

Statistical analysis:

Data were analyzed using the two methods, firstly, by using Linear Mixed Model Least Squares and Maximum Likelihood (LSMLMW) computer program of Harvey (1990) for obtained the main effects. The following model was used in the first analysis:

$$Y_{ijkl} = \mu + S_i + M_j + Y_k + P_l + \beta\,(Age) + e_{ijklm} \qquad (1)$$

Where:

Y_{ijkl} = the individual observation,
M = the overall mean,
S_i = the random effect of the i^{th} sire, i = 1 to 44,
M_j = the fixed effect of the j^{th} month of calving; j = 1, 2, 3,……., and 12 (January, February, March….. and December),
Y_k = the fixed effect of the k^{th} year of calving, k = (85, 86, 87, ….., 2003),
β = Partial linear and quadratic regression coefficients, respectively for different traits studied on age at first calving (months).
e_{ijklm} = Residual term assumed to be random and distributed as a normal distribution with mean zero and variance σ^2e.

Secondly, data analyzed to estimate the variance and covariance component with derivative-free restricted a maximum likelihood (REML) procedure using the MTDFREML program of Boldman *et al*., (1995). The multiple models were included the additive genetic effect of animal, maternal genetic effect and the maternal effect due dam (permanent environmental), which allowed for estimation of the genetic covariance between direct and maternal genetic effects as follows:

$$Y = X\beta + Za + Mm + Wpe + e$$

Where: Y = a vector of observations, β = a vector of fixed effects, a = vector of additive genetic effects, m = vector of maternal genetic effects, M = the incidence matrix relating records to maternal genetic effect, pe = vector of environmental effects contributed by dams to records of their progeny (permanent environmental), W = is the incidence matrix relating records to permanent environmental effects and e = vector of the residual effects. X and Z are incidence matrices relating records to fixed and genetic effects, respectively. The variance and covariance structure for model was as follows:

E(y) =Xb and

V=Error! Bookmark not defined.Error! Bookmark not defined.Error! Bookmark not defined. $\begin{bmatrix} a \\ m \\ pe \\ e \end{bmatrix}$

$$= \begin{bmatrix} A\sigma^2 a & A\sigma_{am} & 0 & 0 \\ A\sigma_{am} & A\sigma^2{}_m & 0 & 0 \\ 0 & 0 & I_d\sigma^2{}_{pe} & 0 \\ 0 & 0 & 0 & I_N\sigma^2{}_e \end{bmatrix}$$

Where: d, is the number of dams and N is the number of records, A is the number relationship matrix among animals, $\sigma^2{}_a$ is the additive genetic variance, $\sigma^2{}_m$ is the maternal genetic variance, $\sigma^2{}_{am}$ is the additive and maternal genetic covariance, $\sigma^2{}_{pe}$ is the maternal permanent environmental variance and $\sigma^2{}_e$= the random residual effect associated with each of observation. Estimates of additive or the direct ($h^2{}_{a)}$ and maternal ($h^2{}_m$) heritabilities were calculated as ratios of estimates of additive ($\sigma^2{}_a$) and maternal genetic ($\sigma^2{}_m$) variance, respectively to phenotypic variance ($\sigma^2{}_p$). The direct maternal correlation (r_{am}) was computed as the ratio of the estimates of direct maternal covariance's ($\sigma^2{}_{am}$) to the product of the square roots of estimates of $\sigma^2{}_a$ and $\sigma^2{}_m$. $\sigma^2{}_{pe}$ is the ratio of estimates of maternal environmental variance ($\sigma^2{}_{pe}$) to the total phenotypic variance ($\sigma^2{}_p$). I_d, I_N are identity matrices of appropriate order, the number of dam and number of animals with records respectively.

Multi-trait animal model (MTAM) was used to estimate BLUP values. The mixed model equations (MME) used for best linear unbiased estimation (BLUE) of function (b) and for the BLUP of (a) and (pe) in matrix notation as follows:

$$\begin{bmatrix} X'X & X'Z & X'W \\ Z'X & Z'Z + A^{-1}\alpha_1 & Z'W \\ W'X & W'Z & W'W + I\,\alpha_2 \end{bmatrix} \begin{bmatrix} \hat{b} \\ \hat{a} \\ p_e \end{bmatrix} = \begin{bmatrix} X\,y' \\ Z\,y' \\ W\,y' \end{bmatrix}$$

Where:

$$\alpha_1 = \frac{\sigma^2 e}{\sigma^2 a} \;, \quad \alpha_2 = \frac{\sigma^2 e}{\sigma^2 p_e}$$

Convergence reached when the simplex variance was less than10-9 and then several extra rounds of iterations were executed to ensure that a global maximum was reached. Best linear unbiased perdition (BLUP) of estimated breeding values was calculated by using MTDFREMAL program for animals in pedigree file for multi-traits analysis.

RESULTS AND DISCUSION

Statistical descriptive:

Unadjusted means and their standard deviations (SD) and coefficient variabilities (C.V) for different studied traits are presented in Table 1.

Table 1. Unadjusted means, standard deviations (SD) and coefficient variabilities (C.V) for 305 day milk yield (305dMY), lactation length (LL), dry period (DP), days open (DO) and calving interval (CI) in a commercial herd of Friesian cows in Egypt.

Trait	Mean	SD	CV%
305dMY (Kg)	4897	1543	31.51
LL (day)	327	69.92	21.38
DP (day)	66.30	21.04	31.73
DO (day)	120	64.71	53.93
CI (day)	401.16	80.30	20.02

The present overall mean of 305dMY was lower (4897 kg) than those estimated by Khattab *et al*., (2000) (5076 kg) from a commercial herds of Holstein Friesian cattle in Egypt and Shalaby *et al*., (2013) (5387 kg) working with another set of Friesian cows at the same farm and was higher than the published estimates on Friesian cattle in Egypt 2655 kg (Oudah *et. al*., 2010) and 3936 kg (El-Awady and Oudah, 2011). In addition, 3710 kg obtained by Tadesse *et al*., (2010) for Friesian cows in Ethiopia.

The present overall mean of LL was 327 days. The same results found by Shalaby *et al*., (2013) working with another set of Friesian cows at the same farm. However a shorter mean (291.86 days) was stated by Sattar *et al*., (2005).

The present overall mean of DP (66.30 days) was shorter than that reported by Oudah *et al*., (2001) on Friesian cattle in Egypt (79.3 days) and Shalaby *et al*., (2013) was (72.9). But it was longer than that obtained by Khattab and Atil (1999) being 65 days. The overall means of DO and CI reported in the present study were 120 days and 401.16 days, respectively (Table 1). These values were lower than the estimates (141 and 422 days, respectively) reported by Shalaby *et al*., (2001) on a similar Friesian herd in Egypt. In this study, the coefficients of variations (CV %) ranged from 20.02 for CI to 53.93% for DO. Such large coefficients of variation are indicative leaders for opportunities for improvement in these traits. The differences between our findings and other investigators may be related to genetic and environmental factors from differences statistical models.

The present results showed that the sire was highly significant (P<0.01) effect on all traits studied under investigation as shown in Table 2. These results are in agreement with the findings obtained by Oudah *et al*., 2008 on DO and CI, Shalaby *et al*., 2001 on TMY.

The present results indicate that the month and year of calving were highly significant (P<0.01) on all traits under investigation and shown that parity was significant (P<0.05 and P<0.01) on dry period, day open and calving interval (Table 2). These results are in agreement with Shalaby *et al*. (2001) found that month of calving was highly significant effect on DO and CI. On the other hand, EL-Barbary *et al*., (1992) found that the parity had no significant on total milk yield of Friesian cows in Egypt. Table 2 showed that the age at first calving as linear and quadratic regression coefficient had significant (P<0.05 and or P<0.01) on all traits under investigation except effect of quadratic regression on DO and effect of linear regression on CI.

Table (2):Least square analysis of variance for 305 day milk yield (305dMY), lactation length (LL), dry period (DP), days open (DO) and calving interval (CI) in a commercial herd of Friesian cows in Egypt.

S.O.V	d.f	F- Significance				
		305dMY	LL	DP	DO	CI
Sires	43	3.34**	1.74**	93.19**	10.73**	35.15**
Month of calving	11	23.14**	3.58**	10.83**	4.54**	15.85**
Year of calving	9	137.50**	25.53**	104.39**	11.25**	55.33**
Parity	4	.01ns	.11ns	8.69**	2.93*	1.11*
Regression						
AFC (L)	1	270.80**	283.94**	275.40**	385.76**	0.27ns
AFC (Q)	1	109.12**	73.68**	997.70**	1.09ns	2.72*
Remainder	2623	20942.41	51.35	71.29	81.05	22746.11

**** significant at P≤ 0.01 * significant at P≤ 0.05 Ns not significant**

Genetic and phenotypic parameters:

Estimates of variance and covariance components are shown in Table 3 while in the Table 4 are those for other genetic parameters.

Direct heritability for305dMY (0.38) was moderate, while for LL, DP, DO and CI were stingy, being 0.13, 0.11, 0.14 and 0.16, respectively. The estimates of maternal heritability for LL, DP, DO and CI were 0.18, 0.14, 0.23 and 0.21, respectively (Table 4) and considered reasonable value compared with h^2_m for 305dMY (0.13). This value is generally higher than to those obtained for Holstein cattle raised in Egypt (Salem *et al*., 2006; El-Arian *et al*., 2003 and Alhammad, 2005) which ranged for LP, DP and CI from (0.03 to 0.12), (0.003 to 0.03) and (0.003 to 0.09), respectively.

The present estimates indicate the direct heritability (h^2_a) of 305dMY is approximately 3.0 times their respective maternal part, while the maternal heritability for other traits investigated almost is close with direct heritability but may be higher as shown in table 4. The present estimates of maternal heritability suggest that maternal effects need to be considered in the analysis model and the selection for productive and reproductive traits in Friesian cows in Egypt. Also, in present study, the maternal permanent environmental effect on 305dMY, LL, DP, DO and CI due to dams accounted for 19%, 21%, 4%, 28% and 9%, respectively from the phenotypic variance.

The estimates of genetic correlations between 305dMY and each of LL, DP and CI were positive and high, being 0.79, 0.92 and 0.98, respectively. In this respect, the estimates of genetic correlations between LL and each of DO and CI were 0.91 and 0.95 respectively. The present results are in the desirable direction indicating that high yielding cows are also having longer LP and shorter DP. Similar results were obtained by Salem and Abdel-Raouf (1999), Shitta *et al.* (2002) and El-Arian *et al.* (2003) on Friesian and Holstein cattle.

Table(3)Estimates of direct and maternal genetic variance and covariance components, permanent environmental and residual of different studied traits using animal model.

Item	Direct and maternal genetic variances and covariances									
Direct	305dMY, a	LL, a	DP, a	DO, a	CI, a	305dMY, m	LL, m	DP, m	DO, m	CI, m
305dMY, a	460.35									
LL, a	168.95	99.35								
DP, a	-17.94	-68.76	109.26							
DO, a	155.47	71.44	7.41	62.03						
CI, a	291.53	131.29	15.94	109.20	192.23					
305dMY, m	94.90	88.18	-13.21	49.77	105.13	159.71				
LL, m	99.43	37.88	-31.97	48.18	62.97	65.60	85.90			
DP, m	-42.90	-9.38	-30.74	-25.01	-34.25	-89.19	-9.81	138.35		
DO, m	-134.53	-79.92	-20.41	-12.14	-35.63	76.64	27.63	-39.90	105.66	
CI, m	-136.47	-63.40	-9.21	-53.18	-108.54	91.51	39.91	-65.61	66.39	95.76

Permanent environmental	305dMY	LL	DP	DO	CI
305dMY, kg	231.28				
LL, d	13.82	101.98			
DP, d	-23.43	32.42	41.22		
DO, d	-91.86	6.91	-35.12	129.89	
CI, d	27.87	2.55	10.55	46.09	39.92
Residual					
305dMY, kg	365.18				
LL, d	23.19	230.03			
DP, d	-50.15	318.40	688.64		
DO, d	43.54	-63.35	-149.48	160.23	
CI, d	121.60	211.84	-146.62	76.63	240.86
Phenotypic*					
305dMY, kg	1217.262				
LL, d	618.65	479.233			
DP, d	119.52	88.63	969.916		
DO, d	716.65	323.19	46.65	457.808	
CI, d	729.49	342.14	124.97	411.22	446.052

Table (4): Direct and maternal heritabilities (diagonal), direct and maternal genetic correlations and direct maternal genetic correlations (below the diagonal), residual variance (temporary variance) as the proportion from phenotypic variance and phenotypic correlations between different traits investigated using animal model.

Item	Direct and maternal genetic variances and covariances									
Direct	305dMY, a	LL, a	DP, a	DO, a	CI, a	305dMY, m	LL, m	DP, m	DO, m	CI, m
305dMY, a	.38±.01									
LL, a	0.79	.13±.01								
DP, a	-0.08	-0.66	.11±.03							
DO, a	0.92	0.91	0.09	.14±.02						
CI, a	0.98	0.95	0.11	1.00	.16±.02					
305DMY, m	0.35	0.70	-0.10	0.50	0.60	.13±.07				
LL, m	0.50	0.41	-0.33	0.66	0.49	0.56	.18±.02			
DP, m	-0.17	-0.08	-0.25	-0.27	-0.21	-0.60	-0.09	.14±.13		
DO, m	-0.61	-0.78	-0.19	-0.15	-0.25	0.59	0.29	-0.33	.23±.18	
CI, m	-0.65	-0.65	-0.09	-0.69	-0.80	0.74	0.44	-0.57	0.66	.21±.14

Permanent environmental	305dMY	LL	DP	DO	CI
305dMY, kg	0.19±0.11				
LL, d	0.09	0.21±0.09			
DP, d	-0.24	0.50	0.04±0.02		
DO, d	-0.53	0.06	-0.48	0.28±0.18	
CI, d	0.29	0.04	0.26	0.64	0.09±0.03
b- Residual					
305dMY, kg	0.30±0.02				
LL, d	0.08	0.48±0.30			
DP, d	-0.10	0.80	0.71±0.19		
DO, d	0.18	-0.33	-0.45	0.35±0.09	
CI, d	0.41	0.90	-0.36	0.39	0.54±0.16
c- Phenotypic					

305dMY, kg	1217.262				
LL, d	0.81	479.233			
DP, d	0.11	0.13	969.916		
DO, d	0.96	0.69	0.07	457.808	
CI, d	0.99	0.74	0.19	0.91	446.052

The phenotypic correlations between 305dMY and each of LL, DO and CI were 0.81, 0.96 and 0.99, respectively. In addition, the phenotypic correlation between DO and CI was 0.91 (Table 4). Estimates of genetic maternal correlations (r_m) between MY and all traits studied except DP were moderate and positive. The estimates of correlations between direct and maternal genetic effects were negative, except among 305dMY, LL and DO were positive in Table 4. Khattab *et al*., (2005) found the same trend.

The results in table 4 agreement with Salem *et al*., (2006), found the genetic correlation between LP and 305d MY was positive being 0.43, and the phenotypic correlation between LP and DP were negative and high (-0.89) on Friesian and Holstein cattle

Predicted breeding value of sires, cows and dams for studied traits 305dMY, LL, DP, DO and CI are present in Table 5. The benefit of abundant and good measurement is that we may be better able to identify the genetically superior animal. This leads to more accurate selection and more genetic improvement. Accuracy of predicted breeding value, ranged from 38 to 88, 73 to 88 and 39 to 89% for sires, cows and dams, respectively, indicate that genetic improvement could be attained through each of cows or sires or dams.

Table (5) Range of breeding values through sires, Cows and Dams and its accuracies, % for 305 day milk yield (305dMY), lactation length (LL), dry period (DP), days open (DO) and calving interval (CI) in a commercial herd of Friesian cows in Egypt.

Traits	Breeding Values			
	Minimum	Maximum	Accuracy, %[1]	Range
Breeding Values of Sires				
305dMY (Kg)	-301±127	161±143	73-79	462
LL (day)	-0.66±1.51	0.39±1.61	38-50	1.05
DP (day)	-0.096±1.69	0.152±2.33	54-79	0.248
DO (day)	-2.58±0.88	3.35±0.96	80-81	5.93
CI (day)	-0.981±1.11	1.28±1.14	88-88	2.261
Breeding Values of Cows				
305dMY(Kg)	-486±135	637±189	73-76	1123
LL (day)	-1.27±1.11	1.65±1.19	73-77	2.92
DP (day)	-1.21±1.52	0.432±1.62	81-84	1.642
DO (day)	-2.46±0.91	3.47±0.94	78-79	5.93
CI (day)	-0.91±1.11	2.01±1.38	81-88	2.92
Breeding Values of Dams				
305dMY(Kg)	-278±192	232±172	39-57	510
LL (day)	-0.71±1.66	0.71±1.61	38-39	1.42
DP (day)	-0.48±2.43	0.32±2.46	46-48	0.80
DO (day)	-3.07±0.89	4.13±0.92	79-80	7.20
CI (day)	-0.91±1.09	2.09±1.14	88-89	3.00

[1] **Accuracy%=**

The present investigation showed that more variation of breeding values and standard errors, this increase the possibility of selection for these traits. Concerning to accuracy of breeding values, the highest accuracy was the value of CI, while the lowest accuracy was the value of LL. High accuracy levels of breeding values help breeders to select for traits in their animals and hence genetic improvement in herds. The present results with agreement found by Radwan *et al*., (2015) working in Holstein Friesian cows raised in Egypt.

Abd El-Harith *et al*., (2002) concluded that breeding values for 305dMY by using the multiple-traits analysis is recommended to obtain more accuracy because it makes use of all the information about the lactation and the covariance among them as the relationship between the relative indifferent traits working in Friesian cows in Egypt.

CONCLUSION

The present results had shown that the estimates of the mean values for traits under investigation in normal range with other studies Commercial Friesian Herd in Egypt. The present heritability estimates for 305-dMY emphasized the possibility of realizing a considerable rate of genetic improvement in this trait under investigation. Genetic enhancement for 305dMY following up improve each of LL, DP and CI. The estimates of heritabilities were low for some traits studied indicated that the major part of the variation in these traits was environmental and selection may not prove effective in bringing about genetic improvement in these traits. Therefore, better management can play a major role in improving these traits. Estimated of breeding values were high ranges indicated the existence of more genetic variation among individuals and hence increase the possibility dairy cattle selection for these traits, which reduce bias from selection and achieve the best accuracy of predictions. In the future this should translate into good herds without productive and reproductive problems which would lead to more and rapid genetic improvement. The accuracies of predicted breeding values, similarly for sires, cows and dams indicate that genetic improvement could be attained through any bath of sires or cows or dams. Also, it could be concluded that selection for traits under this investigation based on direct genetic components only may not give optimal response because of the negative genetic correlation between direct and maternal effects. Therefore, future selection plans for productive and reproductive traits need to consider maternal effects in the analysis models in order to optimize expected total response over the long run.

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تقدير المعايير الوراثية لبعض الصفات الإنتاجية والتناسلية باستخدام نموذج الحيوان فى قطيع فريزيان تجارى فى مصر

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الدراسة اجريت فى قطيع تجارى تابع لجمعية الثروة الحيوانية بشبراتانا- طنطا – محافظة الغربية على ٤٣٧٠ سجل لعدد ٨٧٤ بقرة فريزيان أبناء ٤٤ طلوقة خلال الفقرة من ١٩٨٥ وحتى ٢٠٠٣م لدراسة.واستخدم نموذج الحيوان لتقدير التباين والتباين المشرك لكلا من كمية اللبن فى ٣٠٥يوم وطول موسم الحليب و طول فترة الجفاف وطول فترة التلقيح وطول الفترة بين ولادتين واشتمل نموذج التحليل الاحصائى على شهر وسنة الولادة ورقم موسم الحليب كعوامل ثابتة. واما التاثيرات العشوائية فاشتملت على الحيوان والتاثير الوراثى المباشر والأمى والبيئى الدائم والتاثير المتبقى. كانت المتوسطات العامة لكلا من كمية اللبن فى ٣٠٥يوم و طول موسم الحليب و طول فترة الجفاف و طول فترة التلقيح وطول الفترة بين ولادتين هى ٤٨٩٧ كجم و ٣٢٧ يوم و ١٢٠ يوم و ٦٦.٣ يوم و ٤٠١.١٦ يوم على التوالى. كان تاثير شهروسنة الولادة عالى المعنوية (١%) على جميع الصفات المدروسة. كانت قيم المكافئ الوراثى المباشر للصفات سالفة الذكر هى ٠.٣٨و٠.١٣و ٠.١٤و ٠.١١و ٠.١٦على التوالى. بينما كتنت تقديرات المكافى الوراثى الاموى هى ٠.١٣و ٠.١٨و ٠.٢٣و ٠.١٤ و ٠.٢١ لنفس الصفات المدروسة على التوالى.كان الارتباط الوراثى المباشر والامى يتراوح بين -٠.٦٠الى ٠.٧٤. وكانت الارتباطات الوراثية بين مختلف الصفات المدروسة تتراوح بين (-٠.٨٠ الى ١.٠٠) وبينما كانت الارتباطات المظهرية بين الصفات تحت الدراسة موجبة وتتراوح بين (٠.٠٧الى ٠.٩٩). كان مدى القيم التربوية المقدرة للطلائق هى ٤٦٢ كجم و ١.٠٥يوم و ٠.٢٤ يوم و٥.٩٣ يوم ٢.٢٦ يوم لكمية اللبن فى ٣٠٥يوم وطول موسم الحليب وطول فترة الجفاف وطول فترة التلقيح و طول الفترة بين ولادتين على التوالى. بالمقارنة مدى تقديرات القيم التربوية للامهات لنفس الصفات السابقة هى ٥١٠ كجم و٤٢.١يوم و٨٠.٠يوم و٢٠.٧يوم و٣ يوم على التوالى.و كانت دقة التقديرات للقيمة التربوية تتراوح بين (٣٨ الى ٨٨و ٧٣ الى ٨٨ و ٣٩ الى ٨٩ %) لكلا من الطلائق والابقار والامهات على التوالى وهذا يوضح إمكانية التحسين الوراثى من خلال اى منهما. كانت تقديرات التباين البيئى المؤقت كجزء من التباين المظهرى الكلى لكلا من طول موسم الحليب وطول فترة الجفاف وطول فترة التلقيح وطول الفترة بين ولادتين تتروح بين ٣٥ الى ٧١% وهذا بين امكانية التحسين من خلال تحسين العوامل البيئة الموقتة.