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Estimation of Genetic Parameters and Sire Values for Milk Production of Friesian Cattle Raised in Egypt .

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MILK Production records of the Friesian herd , located at Sakha Experimental Station (140 Km to the north of Cairo), Animal Production Research Institute , Ministry of Agriculture , Egypt were used in this study . Data of 305-day (M305) and total milk yield (TMY) , lactation length (LP) , dry period (DP) , calving interval (CI) and days open (DO) were analysed using Mixed model procedures. Heritabilities and genetic and phenotypic correlations for these traits were estimated . Sires with 10 or more daughters were evaluated by best linear unbiased prediction procedure (BLUP) .

Year-season of calving affected significantly most traits in the first three lactations . The partial regression coefficients of M305 , TMY and LP on age at calving were significant for each lactation , while DP, CI and DO were not significantly linearly dependent on age at calving at all lactations . Most estimates of partial linear and quadratic regressions of all traits on DO were significant for all lactations studied. Heritability estimates in the first , second and third lactations , respectively were 0.30±0.08 , 0.27±0.10 and 0.41±0.15 for M30,0.19±0.10, 0.30±0.08 , 0.28±0.10 and 0.18±0.13 for TMY; 0.16±0.07 and 0.10±0.12 for LP; 0.13±0.07 , 0.00 and 0.14± 0.13 for DP ; 0.18±0.07 , 0.11±0.09 and0.00 for CI and 0.07 ± 0.06 , 0.02±0.08 and 0.23±0.13 for DO.Genetic (r_G),phenotypic (r_P) and environmental (r_E) correlations in the first three lactations were always positive and mostly high between M305 and each of TMY and LP, and between TMY and LP. Correlations were negative between M305 and DP, between TMY and DP, between LP and DP. positive estimates of r_G were obtained between milk yield and CI. LP and DP, in general, had positive r_G and r_E with CI. Estimates of rp among lactation traits

(M305 , TMY and LP)and DP and CI were negative. Positive estimates of r_E between DP and CI were obtained . Positive r_E among M305, TMY and LP were also observed . Percentages of sires with BLUP estimates of ≥+200 Kg in both M305 and TMY in the first la - ctation were 10.5 and 21.0%, respectively .

Key words : Friesian cattle , Lactation , Reproduction , Genetic parameters , Sire values .

Most cattle in Egypt are in hands of small farmers owning less than 5 heads. Sires and cows in such small scale ownership are not selected on their productive or inherent merits and , therefore , no genetic improvement is expected . In formulating a genetic index for use in sire and cow evaluation , there is need to account for non-genetic factors which influence an animal's performance. Also , estimates of genetic and phenotypic parameters of productive and reproductive traits are required for estimating breeding values of animals, for formulating an efficient breeding system and for evaluating genetic gains .

The objectives of this study were : (1) to determine the non-genetic factors affecting some reproductive and productive traits in a Friesian herd raised in Egypt, (2) to quantify the genetic, phenotypic and environmental variation and covariation of those traits and (3) to estimate the sire values of milk production for this herd of Fresian cattle.

Material and Methods

Location and feeding

Data of milk production of Friesian cows were collected during the period from 1960 up to 1986 in a herd of dairy cattle raised in Sakha Experimental Station (located in the northern part of the Nile-Delta). This herd belongs to the Animal Production Research Institute, Ministry of Agriculture, Egypt . The nucleus of this herd was imported to Egypt from the Netherlands as pregnant heifers during the period from 1959 to 1961.

Animals were kept under a regular system of feeding and management suggested by the Animal Production Research Institute. They were fed on Berseem (Trifolium alexandrinum) and rice straw from the beginning of December till the end of May . From the beginning of June till the end of November , animals were fed on a concentrate mixture, rice straw and clover hay. The concentrate mixture consisted of 65% undicorticated cotton seed cake, 20% rice bran , 9% wheat bran , 2% limestone , 1% salt and 3% molasses . In the last two months of pregnancy animals were supplemented with extra amounts of concentrates according to their body weights . Water was allowed to animals freely all time .

Breeding plan and management

Cows were randomly bred all the year round . Dairy bulls were used for breeding purposes after being tested for body conformation , libido and semen characteristics . Breeding bulls , when became infertile, weak, harmfully injured and /or show low performance were replaced with other tested ones . On the average , the mating bull was used for breeding for 6-7 years .

Heifers which appeared in a good stamina were joined to the breeding stock, while those showing abnormal defects , weakness or lower body weight than normal weight were excluded . They were bred for the first time when they had reached about 330 kg body weight or 24 months of age (whichever came first) .

Calvers showing infertility , weakness or illness were excluded . Cows were bred during the first heat period after the 60th day post partum . Pregnancy was detected by rectal palpation 60 days after service , and those failed to conceive were rebred in the next heat period .

Cows were milked twice a day at 7.00 and 16.00 o'clock . cows were usually milked until two months before the next expected calving and were dried off by gradual incomplete milking .

Data

A total of 3411 first three lactation records were used . Data of the normal lactations and those naturally dried were collected . Productive traits studied were 305-day milk yield (M305) , total milk yield (TMY) , length of lactation (LP) , dry period (DP) while the reproductive traits were calving interval (CI) and days open (DO) .

Statistical Analysis

Data of each lactation were analyzed separately using least-squares and maximum likelihood program of Harvey (1990). Data of M305, TMY, LP and DP were analysed using the linear mixed model :

$$Yijk = U + Si + YSj + b1_L(X1ijk - X1) + b1Q\ (X1ijk - X1)^2 + b2_L\ (X2ijk - X2) + b2_Q\ (X2ijk - X2)^2 + eijk$$

Where Yijk = the observation on the ijk lactation; Si=the random effect of ith sire; YSJ = the fixed effect of jth year-season of calving ; $b1_L$ and blQ= the linear and quadratic partial regression coefficients of productive trait of ijk lactation on age of cow at calving ; X1ijk = the age of the cow at calving in months for the corresponding Yijk records ; X1 =the mean of age ; 62L and b2Q = the linear and quadratic partial regression coefficients of productive trait of ijk lactation on period of days open ; X2ijk =the length of days open for the corresponding Yijk records ; X2 = the mean of days open ; eijk = a random error particular to the ijk*th* lactation and assumed independent , normally distributed with zero mean and equal variance. Data of CI and DO were analysed by using the same previous model after excluding DO (as a covarite) from the model .

Estimation of variance and covariance component depends mainly on Henderson's Method 3(Harvey , 1990). Accordingly,estimates of sire($\sigma^2 s$) and remainder ($\sigma^2 e$ components of variances and covariances were obtained . The heritability ($h^2 s$) for each trait and the genetic correlation (r_G) between any two traits as well as their standard errors were estimated using the formula described by Harvey (1990) .

Predicted sire values for milk production trait in the first lactation were estimated by using the procedure of Best Linear Unbiased Prediction (BLUP) . These values were obtained by using records in each sire with more than ten daughters . The number of daughters used per sire ranged from 10 to 57 in the first lactation . Abubakar et el . (1986) with 350877 lactation records of 4468 sires concluded that 10 daughters per sire are considered a minimum number for the evaluation of sires (using BLUP procedure) in tropical areas .

Results and Discussion

Means and variation of uncorrected records

Means , standard deviations and coefficients of variation for the productive and reproductive traits in the first three lactations are given in Table 1 . These means were lower than those reported by Khattab and Ashmawy (1988) . Also , these data indicate that LP, DP and DO of different lactations were longer than those reported on the same breed in Egypt by Mohamed (1987), Khattab and Ashmawy (1988) and El-Sedafy (1989); and shorter than those reported by Ragab *et al.* (1973). Calving interval of the different lactations of this study (459.3, 433.6 and 413.9 days) are within the range of estimates (411 to 462 days) obtained by Basu and Ghai (1980) , Mohamed (1987) and El-Sedafy (1989) . However , the relatively long DO and CI in dairy cows (Table 1) may be caused by several factors , *e.g.* level of milk production , housing , silent heat , missed oestrus due to weak symptoms , frequency and timing of oestrus detection , and availability of green fodder.

Coefficients of variation (CV) in milk yield and LP of the first three lactations (Table 1) were nearly the same and within the range of 12.5 - 38.8 % reported in the literature (Soliman and Khalil , 1989). The coefficients of variation for DP in the first three lactations were relatively high (87.8, 75.5 and 75.9%) . Estimates for CI in the first three lactations (Table 1) were moderate or high (28.9, 30.5 and 13.7%), while much variation was observed for DO (65.9 , 70.0 and 69.4%) . However , poor management of cow herds in Egypt lead to such high phenotypic variation in DO and CI .

Year- Season of calving

Estimates of individual year-season effects are too numerous to be reported here . Least - squares means for the effects of year-season of calving indicated that milk yield in the last ten years (1976-1986) were higher than those of the years preceding that period , *i.e.* there was an upward trend in milk yield over the years . This trend is probably due in part to genetic improvement and partly to improved feeding and managerial procedures .

TABLE 1. Means, standard deviation (SD) and coefficients of variation (CV%) of uncorrected records of different productive and reproductive traits of Friesian cattle in the first three lactations.

Lactation number	M305 (kg)	TMY (kg)	LP (Days)	DP (Days)	CI (Days)	DO (Days)
First lactation						
Mean	2149	2460	341	135	459	190
SD	761	1062	109	104	151	131
CV%	26.6	33.0	22.9	67.5	28.7	65.7
Second lactation						
Mean	2466	2747	342	112	433	170
SD	814	1007	101	90	145	122
CV%	26.1	28.7	23.3	74.7	30.2	69.6
Third lactation						
Mean	2669	2922	332	99	413	149
SD	869	1136	99	86	131	110
CV%	26.9	32.4	22.6	76.5	13.4	68.2

Age at calving

Constants of partial linear and quadratic regression coefficients of M305, TMY and LP on age at calving reveal, in general, that there was a curvilinear relationship between age at calving and each of the three traits (Table 2). Also, El- Sedafy (1989) on data from the same herd obtained a significant ($p< 0.05$) linear regression coefficient of LP on age of the cow. Partial regression coefficients of length of DO, DP and CI on age at calving were generally not significant (Table 2). Constants of partial linear and quadratic regression coefficients, indicate that age at calving was insignificantly associated with CI and DO(Table 2). In this respect, age-of- calving effects were found to be non-significant on CI (Basu and Ghai, 1980; Sharma, 1982) and on DO (Sharma, 1982; Mohamed, 1987).

Days open

Constants of partial linear regression coefficients (Table 2) reveal that each one day increase in days open (over its average) was associated with an increase of 0.52, 0.33 and 0.87 kg in M305 of the first, second and third lactation, respectively as well as of 2.45, 1.97 and 3.54 kg in TMY, respectively ($p <0.001$). A significant negative quadratic relationship was detected between milk yield and DO. This agrees well with findings of Basu and Ghai (1980) and khattab and Ashmawy (1988) who showed that

TABLE 2. Estimates of partial polynomial regression analysis (b) of different traits on age at calving and days open in the first three lactations.

Lactation No.	Age at calving (month)		Days open (days)	
	Linear (unit/month) b ± SE	Quadratic (unit/month^2) b ± SE	Linear (unit/month) b ± SE	Quadratic (unit/month^2) b±SE
First lactation				
M305 (kg)	18.015±4.362***	-0.233±0.369***	0.516±0.131***	-0.0031±0.0012***
TMY (kg)	25.231±6.140***	-0.530±0.557***	2.450±0.184***	-0.0050±0.0010***
LP (days)	1.812±0.588**	0.007±0.053**	0.458±0.017***	-0.0010±0.0001***
DP (days)	0.318±0.679	-0.121±0.062	0.345±0.020***	-0.0001±0.0003**
CI (days)	-0.092±0.984	0.055±0.089*	0.474±0.029***	-0.0002±0.0001
DO (days)	0.857±0.930	0.010±0.080		
Second lactation				
M305 (kg)	8.284±6.098***	-0.933±0.518***	0.333±0.209***	-0.0031±0.0010*
TMY (kg)	11.306±7.413***	-1.018±0.629***	1.968±0.255***	-0.0062±0.0012***
LP (days)	1.183±0.735***	0.049±0.062***	0.319±0.025***	-0.0010±0.0001***
DP (days)	-0.004±0.785	0.026±0.067	0.264±0.027***	0.0001±0.0003
CI (days)	1.182±0.920	-0.006±0.004	0.437±0.042***	-0.0002±0.0001
DO (days)	1.050±0.770	-0.000±0.003		
Third lactation				
M305 (kg)	14.563±9.161***	-0.586±0.898**	0.871±0.367***	-0.0051±0.0002**
TMY (kg)	24.799±11.90***	-0.790±1.167*	3.538±0.477***	-0.0031±0.0002
LP (days)	1.704±0.926**	-0.074±0.091	0.522±0.037***	-0.0001±0.0003
DP (days)	-1.779±0.915*	0.271±0.089*	0.344±0.037***	0.0002±0.0001
CI (days)	-0.045±0.689	0.073±0.068	0.927±0.028***	-0.0010±0.0001***
DO (days)	-1.610±1.261	0.083±0.123		

* = P < 0.05, ** = P < 0.01 and *** = P < 0.001.

Do exerted significant (P < 0.05 or P< 0.01) effects on M305 and / or TMy. Results of the present study also indicated that milk yield traits increased curvilinearly with the increase of days open . From the economic point of view , it would not be desirable to prolong the DO. Also , these results show that each one day increase in DO (over the average) has resulted in an increase of 0.46 , 0.32 and 0.52 days in the length of LP of first , second and third lactation, respectively and of 0.35 , 0.26 and 0.35 days in length of DP of the same lactations in the same order . In agreement with these findings , khattab and Ashmawy (1988) from Friesian in Egypt reported that each additional day in days open until 90 days added an extra day of lactation . Basu and Ghai (1980) found that as the length of open period increased , M305 and TMY increased considerably .

Partial linear regression coefficients of CI on DO showed positive association between the two aspects . DO effects on CI were found to be significant ($p < 0.001$) in the first three lactations (Table 2) .

Sire effect

Estimates of variance component for sire and residual effects associated with productive and reproductive traits in the first three lactations are shown in Table 3. All traits were significantly ($p < 0.05$ or $p<0.01$) affected by sire over the first three lactations (Table 4). This result is in agreement with that reported by Berger *et al.* (1981) and Soliman and Khalil (1989) .

TABLE 3. Variance component estimates ($\sigma^2 2$) and percentages of variation (V%) and heritability estimates (h^2) for productive and reproductive traits in the first three lactations.

Trait	Lactation number	Sire			Remainder			$h^2 \pm SE$
		d.f	σ^2_s	V%	d.f	σ^2_e	V%	
M305	1	193	26533***	7.5	1372	326558	92.5	0.30±0.08
	2	160	29897***	6.7	831	414004	93.3	0.27±0.10
	3	115	58847***	10.2	492	518368	89.8	0.41±0.15
TMY	1	193	53822***	7.5	1372	657840	92.5	0.30±0.08
	2	160	46762***	7.0	831	621141	93.0	0.28±0.10
	3	115	42799***	4.5	492	899406	95.5	0.18±0.13
LP	1	193	248***	3.9	1372	6089	96.1	0.16±0.07
	2	160	316***	4.7	831	6366	95.3	0.19±0.10
	3	115	138***	2.4	492	5650	97.6	0.10±0.12
DP	1	193	270***	3.2	1372	8305	96.8	0.13±0.07
	2	160	a	0.0	831	7026	100.0	a
	3	115	210***	3.5	492	5765	96.5	0.14±0.13
CI	1	193	802***	4.4	1372	17422	95.6	0.18±0.07
	2	160	467***	2.6	831	17184	97.4	0.11±0.09
	3	115	a	0.0	492	3094	100.0	a
DO	1	193	261***	1.7	1375	15575	98.3	0.07±0.06
	2	160	59***	0.0	833	14110	99.9	0.02±0.08
	3	115	626***	5.7	494	10426	94.3	0.23±0.13

* = $P < 0.05$, ** = $P < 0.01$ and *** = $P < 0.001$.

[a] Negative estimates of sire component of variance set to zero.

TABLE 4. F-ratios and coefficients of determination (R^2) for factors affecting productive and reproductive traits of Friesian cattle in the first three lactations.

S.O.V.	d.f	M305	TMY	LP	DP	CI	d.f	DO
1st lactation								
Sire	193	1.61***	1.61***	1.30***	1.24***	1.34***	193	1.13***
Year-season	83	2.97***	2.19***	2.13***	1.29***	1.25***	82	1.58***
Reg. on days open								
Linear	1	46.26***	212.97***	778.83***	121.68***	183.23***		
Quadratic	1	19.92***	21.67***	62.80***	9.20**	0.35		
Reg. on age at calving								
Linear	1	12.77***	13.63****	10.56**	0.51	0.00	1	1.11
Quadratic	1	15.72***	16.54***	10.57**	0.31	0.20	1	1.34
Remainder	1372	326558	657840	6089	8305	17423	1375	15575
2nd lactation								
Sire	160	1.41***	1.43***	1.29***	0.93	1.16***	160	1.02***
Year-season	79	1.77**	1.35***	0.94	1.36***	1.19***	79	1.20***
Reg. on days open								
Linear	1	12.58***	103.73***	307.92***	51.93***	80.52***		
Quadratic	1	5.74*	17.15***	54.46***	0.42	0.23		
Reg. on age at calving								
Linear	1	22.66***	29.11***	11.01***	1.54	0.36	1	0.76
Quadratic	1	29.32***	35.69***	14.53***	1.38	3.24	1	0.11
Remainder	831	414005	621141	6367	7026	17184	833	14110
3rd lactation								
Sire	115	1.60***	1.23***	1.12***	1.18***	0.88	115	1.29***
Year-season	71	2.29***	1.86**	1.50*	0.96	1.80**	71	1.65***
Reg.. on days open								
Linear	1	19.57***	48.73***	145.22***	54.48***	1140.76***		
Quadratic	1	6.84**	1.98	0.62	0.01	41.75***		
Reg. on age at calving								
Linear	1	35.54***	28.94***	10.71**	4.09*	0.00	1	2.34
Quadratic	1	7.07**	4.12*	2.75	6.09*	2.55	1	0.04
Remainder	492	518368	899406	5650	5765	3095	494	10427

* = P < 0.05, ** = P < 0.01 and *** = P < 0.001.

The sire component of variance ($\sigma^2 s$) for milk yield ranged ranged from 4.5 to 10.2% and was in the high range of reviewed estimates . Camoens *et al* . (1976) , Abubakar *et al.* (1986) and Soliman and khalil (1989) obtained estimates ranged between 2.0 and 12.5%. Sire component of variance ($\sigma^2 s$) for M305 increased from the first to the third lactation (Table 3) while the reverse was observed for TMY . Soliman and Khalil (1989) reported that the sire contribution ranged from 11.1 to 13.6% for yield traits in 305-day lactation , while the corresponding estimates in total lactation ranged from 9.1 to 10.7 % .

Sire component of variance for LP was 3.9,4.7 and 2.4 % (Table 3) for the first, second and the third lactation , respectively. These estimates were higher than 1.7 and 1.2 % obtained by Abubakar *et al* . (1986) , Soliman and Khalil (1989) , respectively , but lower than 8.5 % obtained by Camoens *et al.* (1976) who reported negative estimates for this trait . Estimates given in Table 4 show that DP , CI and DO had a low sire component of variance which ranged between 0.0 and 5.7 %. Similarly , Berger *et al* (1981) and Sharma (1982) obtained low estimates for these traits . Significant sire effects on DP , CI and DO were reported by Basu and Ghai (1980) . On the contrary , Berger *et al.* (1981) and Sharma (1982) observed that the effects of sire on CI and DO were not significant .

Heritability

Heritability estimates ($h^2 s$) for productive and reproductive traits in the first three lactations are listed in Table 3. In general , estimates of $h^2 s$ for M305 were higher than those for TMY and LP. These differences could be attributed to greater influence of environmental factors on TMY and LP than those of M305 . This trend was also confirmed by results of Soliman and Khalil (1989) . Heritability estimates for M305 (Table 3) fall within the range obtained by Soliman and Khalil (1989).

For LP and DP , heritability values estimated from the present data are generally low. These estimates are in agreement with those of Ragab *et al* (1973). Low heritability estimates for LP and DP suggest that management can play a greater role than selection for improving these traits .

The low estimates for CI and DO indicate that a major part of variation in these characters was environmental and selection would not be effective in bringing about genetic improvement . Better management can therefore play an important role in improving such traits .

Genetic correlations (r_G)

Most estimates of r_G were similar to the corresponding estimates of rp in directions and were higher in magnitudes .

The M305 (Table 5) had high positive r_G with TMY (0.88 to 1.02) and LP (0.24 to 0.54). These mainly part-whole genetic relationships indicate that milk yield in 305-day of lactation could be good indicators for production in total lactation . Positive genetic association between milk yield and LP were obtained by Ragab *et al* . (1973) in Friesian cattle. In this respect , Ashmawy (1981) stated that genes of parent producing animals

TABLE 5. Genetic (r_G) with standard errors (SE), phenotypic (rp) and environmental (r_E) correlations among different traits in the first three lactations.

Traits Correlated	Lactation No	r_G ± S.E	r_P	r_E
M305-TMY	1st	0.97±0.04	0.83	0.77
	2nd	0.88±0.06	0.89	0.89
	3rd	1.02±0.01	0.87	0.85
M305-LP	1st	0.46±0.20	0.41	0.40
	2nd	0.54±0.28	0.27	0.19
	3rd	0.24±0.47	0.37	0.44
M305-DP	1st	-0.71±0.037	-0.27	-0.17
	2nd	a	-0.19	a
	3rd	-0.08±0.46	-0.32	-0.42
M305-CI	1st	0.67±0.025	0.01	-0.20
	2nd	0.47±0.44	0.05	-0.04
	3rd	a	0.02	a
TMY-LP	1st	0.66±0.15	0.64	0.64
	2nd	0.89±0.17	0.57	0.48
	3rd	0.40±0.55	0.64	0.68
TMY-DP	1st	-1.11±0.45	-0.33	-0.15
	2nd	a	-0.22	a
	3rd	-0.19±0.70	-0.38	-0.41
TMY-CI	1st	0.63±0.25	-0.01	-0.21
	2nd	0.37±0.44	0.00	-0.08
	3rd	a	-0.06	a
LP-DP	1st	-1.30±0.66	-0.42	-0.27
	2nd	a	-0.02	a
	3rd	0.38±1.14	-0.50	-0. 62
LP-CI	1st	0.11±0.32	-0.16	-0.22
	2nd	-0.16±0.51	-0.12	-0.11
	3rd	a	-0.01	a
DP-CI	1st	-0.19±0.32	0.43	0.54
	2nd	a	0.48	a
	3rd	a	0.08	a

[a] Negative estimates of sire component of variance set to zero.

with long LP are correlated with those genes favorable for milk production and therefore , selection against short LP is also expected to be guided against low production .

The estimates or r_G between milk yield and DP (Table 5) were negative (-0.08 to -1.11) . In agreement with this result , Bhatnagar *et al.* (1983) reported that milk yield had low and negative r_G with DP . In this concern, Ashmawy (1981) noted that , a cow with a very long DP has unproper body conditions for milking and its total milk produced in its productive life is not increased .

LP was negatively correlated with DP (Table 5). Selection for higher LP will therefore lead to shorter DP. This is in agreement with findings of Bhatnagar *et al.* (1983) which showed negative estimate of r_G between LP and DP.

Positive estimates of r_G were obtained between milk yield and CI (Table 5) . Such positive and unfavorable r_G between milk yield and CI can be explained on the basis of the effect of delayed pregnancy on milk production . Similarly , most of the reviewed studies showed unfavorable r_G between milk yield and CI (*e.g.* Berger *et al.*, 1981 ; Strandberg and Danell , 1988).

LP, in general , had positive r_G with CI (Table 5). Most estimates of r_G showed that DP was positively correlated with CI (Table 5). Also, Basu and Ghai (1980) reported that DP was positively correlated with DO.

Phenotypic correlations (rp)

The high rp ' s obtained among productive traits give, in practice, a considerable advantage in management and culling policy for such a breed of dairy cattle .

Estimates of rp between milk yield (MY) and LP (Table 5) were relatively high and ranged between 0.27 to 0.64 . These estimates were in agreement with what found in other studies (Ragab *et al.* 1973 ; Abubakar *et al* ., 1986) which showed high positive rp between milk yield and LP , *i.e.* there was a positive phenotypic dependency of milk yield on LP . The rp's between milk yield traits and DP (Table 5) were mostly negative in direction and of moderate magnitudes (rp ranged between -0.19 to-0.38).In agreement with these findings, Basu and Ghai (1980) and Bhatnager *et al* . (1983) reported negative rp between milk yield and DP . Estimates of rp between LP and DP (Table 5) were negative and generally of moderate magnitudes (-0.20 to - 0.50) . This is in agreement with those estimates of Bhatnagar *et al* . (1983) which indicate that rp between LP and DP were negative and of high magnitude . The trend of the phenotypic association between length of LP and DP observed in this work was similar to that shown between milk yield and DP . This trend was evidently confirmed in most of the literature available (*e.g.* Basu and Ghai, 1980 ; Bhatnagar *et al*, 1983) . This could be due to the strong positive association between milk yield and LP .

Estimates of rp between lactation traits (MY and LP) and CI indicate some phenotypic antagonism between milk traits and CI (*e.g.* negative and / or positive estimates were observed for correlations between CI and milk yield) . However, estimaes of rp between M305 and CI are smaller than the corresponding estimates for total lactation (Table 5). Small rp between milk production and DO, comparable to those in the present study , have been reported in many studies (*e. g.* Bhatnagar *et al.*, 1983) , while estimates of rp with CI were usually found to be somewhat higher (Basu and Ghai , 1980 ; Strandberg and Danell, 1988). Phenotypic correlations between DP and CI were positive and of moderate magnitudes (Table 5) .

Environmental correlations (r_E)

Estimates of r_E among milk traits , in most cases , were nearly equal in size and similar in sign with estimates of rp (Table 5) . These re emphasize the large environmental influences the cow has on he milk . In some cases the rg and re are different in magnitude , or even in sign . In other cases the two correlations are of the same sign and not very different in magnitude , and this is the more usual situation in the present study . A large difference , and particularly a difference in sign, shows that genetic and environmental sources of variation affect the characters through different physiological mechanisms (Falconer , 1989).

Table 5 show that estimates of r_E between M305 and TMY were high and positive . Similar trend for r_E between TMY and LP was observed . These results lead to state that an improvement in the environment (i.e. management , feeding , housing , ... etc) affecting milk yield would be associated by an improvement in environment affecting LP. In general , negative estimates of r_E between DP and each of M305 , TMY and LP were obtained . This means that better environmental and managerial conditions will optimize DP and consequently more yield and days in milk obtained .

Blup estimates and sire Evaluation

BLUP estimates for M305 ranged from -347 to 527 Kg in the first lactation (Table6). Similarly , El-Chafie (1981) with Friesian x Native cows in Egypt reported that the range of BLUP estimates of 17 sires for M305 was large and found to be between -801.94 and 341.62 kg. Abubakar *et al.* (1986) with 15512 daughters lactation records of 138 Jamaica Hope sires (each with 10 or more daughters) found that predicted sire values (BLUP) in M305 were between -400 kg and +400 kg . However, there was a difference of 874 kg of milk between the top and bottom sires in the first lactation (Table 6). Accordingly , it is safe to conclude that there is a high genetic potential for rapid genetic progress in M305 through sire selection . Consequently and from the genetic point of view , there is considerable potential (arising from the high variability exhibited among sires) for improvement of milk production through sire selection within the Friesian herd in Sakha , Egypt .

Considering TMY , estimates of BLUP ranged between -700 and 634 kg in the first lactation (Table 6). Abubakar *et a*l. (1986) found that sire BLUP values for TMY of 17 sires from the United States (that had progeny in USA , Mexico and Colombia) ranged from -165 to 627 kg in USA , from -368 to 365 kg in Mexico and from -229 to 313 kg in Colombia .

Regarding to M305 , about 52.6 % of the sires had negative BLUP estimates in the first lactation . The corresponding percentages for TMY were 50.8 %. EL-Chafie (1981)

TABLE 6. BLUP estimates of Friesian sires + for 305-day milk yield (M305) and total milk yield (TMY) in the first lactation.

Sire code	No. of daughters	BLUP estimates M305(kg)	BLUP estimates TMY (kg)	Sire code	No. of daughters	BLUP estimates M305(kg)	BLUP estimates TMY (kg)
117	10	-8	20	53831	28	-37	-95
290	20	527	634	53853	16	-19	-150
1515	13	283	496	53900	27	-73	23
29080	21	95	146	53921	14	96	39
29522	49	27	-29	53950	13	-17	118
29523	12	35	4	54007	17	-71	-194
29525	11	-76	-113	54024	21	-347	-700
29526	32	-11	-94	54398	26	71	48
29528	12	-76	451	54817	16	18	330
29589	24	-22	1	54889	17	84	70
30522	15	-105	-56	55360	19	374	665
31767	10	-32	-190	55375	13	-71	-107
32161	18	-345	-419	56252	12	-37	-120
33639	12	183	167	56309	18	-75	-161
34503	25	-17	-107	56337	14	6	-83
50948	25	-9	113	56358	57	-136	-206
51055	11	96	330	57748	11	140	164
51208	15	0	93	57893	43	-306	-451
51217	15	-296	-251	57958	14	396	505
51589	14	22	316	58115	15	-338	-365
51663	31	218	384	58498	14	-75	-211
51700	27	-108	23	97768	15	15	-58
51856	11	-38	-255	97770	22	0	-59
51955	13	228	450	97786	43	10	10
52213	11	10	-85	98080	16	42	-71
52216	11	179	207	98083	42	0	-90
52681	13	95	-79	98085	10	36	98
53650	13	-149	-107	98086	16	-86	-213
53730	20	327	355				

+ BLUP values were estimated by using records of at least ten daughters per sire.

reported that the percentage of sires having negative estimates of sire transmitting ability of 300 days milk yield was 28 %.

The BLUP estimates presented in Table 6 , reveal that the percentages of sires with values of greater than 200 kg (more than the average of herd) in both M305 and TMY ranged between 12.28 and 21.0% in the first lactation and selecting these sires for breeding purposes may lead to rapid genetic improvement for milk yield . These results may be evident by the fact that about 47.4 % of the sires evaluated having positive

BLUP estimates in the first lactation . Moreover , these positive percentages are higher than those estimates of El-Chafie (1981) who reported that the percentages of sires with positive BLUP estimates were about 22% for Friesian sires that sired Egyptian Friesian-native cows .

General Discussion and Conclusion

The significant curvilinear relationship between age at calving and productive traits leads to conclude that correction of lactation records for age at calving must be considered in case of sire or cow evaluation . It is evident also , in the present study , that lactation records must be adjusted for linear and quadratic effects of days open in order to obtain reliable estimates of sire or cow evaluation .

There was no systematic change in heritabilities and genetic or phenotypic variances for different reproductive and productive traits studied over the first three lactations .

In relation to the level of h^2s estimates for different traits studied , milk yield seems to be more amenable to selection . Low estimates of h^2s for interval traits (*e.g.* CI , DO and DP) reported here do not necessarily a possible use of these traits in a progeny testing scheme . However , lengthening of these intervals may be caused by several factors , *e.g.* delayed onset of ovarian activity , silent oestrus or missed oestrus due to weak symptoms or poor oestrus detection which are among the most important factors involved in fertility problems in dairy cattle in Egypt (EL - Sedafy,1989).

Days open and lactation period in the first lactation are closely genetically and phenotypically related . Therefore , shortening days open would not be a goal itself . The ultimate goal in selection for better reproductive performance should be to shorten the days open or calving interval parallel with an improvement in conception rate . A major drawback with such interval traits studied (*i.e* days open, lactation period, dry period) as a selection criteria is that selection for any one of the intervals requires at least one calving which may cause the delay in bull evaluation .

Unfavorable correlations between interval traits (*e.g.* dry period and days open) and productive traits obtained in the present and reviewed studies (Berger *et al.*, 1981 ; Strandberg and Danell , 1988) may be influenced by other causes than purely genetic ones . This emphasizes the need for the inclusion of some interval traits in the selection criterion . Also , such results must be interpreted with caution . For example , it has been shown that days open was influenced to a great extent by factors at herd level . Thus , if the Egyptian farmers were to inseminate their high -yielding cows later than moderate or low-producing cows this would automatically produce an antagonistic genetic correlation between milk yield and days open . It is also possible that high-producing cows will have more chances for conception than low-producing cows, a management practice which could also create a " false " genetic antagonism. Lack of visible heat later in high-yielding than in low-yielding cows may be another cause of an antagonistic relation that may at least be partly genetic . A higher incidence of retained placenta in high-yielding cows might have the same effect . Accordingly , genetic correlation estimates between milk production and the interval traits (*e.g.* days open) is subject to these influences .

Percentages of sires having positive estimates of BLUP for lactation traits were generally high (about 50 %) and consequently the values of sires for such traits using the BLUP procedure would help in predicting the true genetic value of sires .

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تقدير المقاييس الوراثية والقيم الأبوية لانتاج اللبن لماشية الفريزيان المرباة فى مصر

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أستخدمت لهذه الدراسة سجلات إنتاج وتناسل أبقار الفريزيان الموجودة بمحطة بحوث سخا بمحافظة كفر الشيخ والتابعة لمعهد بحوث الانتاج الحيوانى - مركز البحوث الزراعية - وزارة الزراعة. تم تحليل بيانات الصفات الانتاجية والمتمثلة فى إنتاج ٣٠٥ يوم من اللبن وناتج اللبن الكلى خلال موسم الادرار وفترة الإدرار وفترة الجفاف وكذلك بعض الصفات التناسلية مثل الفترة بين ولادتين وفترة الأيام المفتوحة بإستخدام النموذج الخطى المختلط .

تم تقدير المكافىء الوراثى والارتباط الوراثى والمظهرى والبيئى بين الصفات المختلفة ، كذلك تم تقييم الطلائق لإنتاج اللبن بإستخدام طريقة أحسن تنبأ خطى غير متحيز مقتصرة على سجلات الطلائق التى لها عشرة بنات فاكثر .

كان متوسط إنتاج ٣٠٥ يوم من اللبن للموسم الأول والثانى والثالث على التوالى هو ٢١٤٩ ، ٢٤٦٦ ، ٢٦٦٩ كجم ، بينما كان متوسط الناتج الكلى من اللبن هو ٢٤٦٠ ، ٢٧٤٧ ، ٢٩٢٢ كجم ومتوسط فترة الأدرار هو ٣٤١ ، ٣٤٢ ، ٣٣٢ يوم ومتوسط فترة الجفاف هو ١٣٥ ، ١١٢ ، ٩٩ يوم ومتوسط الفترة بين ولادتين هو ٤٥٩ ، ٤٣٣ ، ٤١٣ يوم ومتوسط فترة الايام المفتوحة هو ١٩٠ ، ١٧٠ ، ١٤٩ يوم بنفس ترتيب هذه المواسم .

وجد تاثير معنوى لسنة وموسم الولادة على معظم الصفات خلال الثلاثة مواسم الأولى .

وجد أن معامل إعتماد كل من إنتاج ٣٠٥ يوم من اللبن وناتج اللبن الكلى وفترة الإدرار على العمر عند الولاده معنويا لكل موسم من المواسم الثلاثة الأولى .

كان معامل إعتماد كل الصفات المدروسة على فترة الأيام المفتوحة معنويا .

تم تقدير المكافىء الوراثى لإنتاج ٣٠٥ يوم من اللبن حيث تراوحت قيمتة ما بين ٢٧و الى ٤١و . بينما تراوحت قيمته لانتاج اللبن الكلى مابين ١٨ ، . إلى ٣٠ ، . وتراوحت قيمتة لفترة الإدرار ما بين ١٠ و . إلى ١٩ و . وقيمتة لفترة الجفاف ما بين صفر إلى ١٤ و . وللفترة بين ولادتين ما بين صفر الى ١٨ و . ولفترة الأيام المفتوحة ما بين ٢. و . إلى ٢٣ و ثبت وجود إرتباط وراثى ومظهرى موجب بين إنتاج ٣٠٥ يوم من اللبن وكل من ناتج اللبن الكلى وفترة الإدرار .، وكذلك الإرتباط بين الفترة بين ولادتين وفترة الأيام المفتوحة .

وجد أن نسبة الطلائق التى قيمة أحسن تنبأ خطى غير متحيز لها أكبر من أو تساوى ٢٠٠ كجم لكل من انتاج ٣٠٥ يوم من اللبن وناتج اللبن الكلى فى الموسم الأول هى ٥و١٠ ٪ و٢٠ ٪ على الترتيب .