# PRODUCTIVE AND REPRODUCTIVE PERFORMANCE OF FRIESIAN COWS RAISED UNDER THE EGYPTIAN CONDITION

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## SUMMARY

*The objectives of this study were to predict the influence of sire and some environmental factors on milk traits and reproduce ability and estimate heritability, genotypic correlation and breeding value of cows, sire and dam. A total of 1976 records were collected for over 12 years from Alkarda farm (Government farm) located in Kafr El-sheikh governorate, the dairy herd belongs to Animal Production Research Institute (APRI), Egypt. Studied traits were productive and reproductive traits including total milk yield (TMY, kg), 305-day milk yield (305-DMY, kg), lactation period (LP), days open (DO) and calving interval (CI). The analysis was performed using: General linear model (GLM) procedure (SAS, 2003) to determine the fixed effects (parity, year and season of calving) and random effects of sire. Data were analyzed by Multiple Traits Derivative Free Restricted Maximum Likelihood (MTDFREML) according to Boldman et al. (1995) to estimate variance components, heritability and breeding value of cow, sire and dam using Best linear unbiased prediction (BLUP) calculated by back solution for all animals in the pedigree file. Actual means of TMY, 305-DMY, LP, DO and CI were 3361.9 kg, 2939.1 kg, 310 day, 148.7 day and 451 day, respectively. The study showed significant effects of sires selection on all traits, allows the possibility of selection to improve these traits through sires, also non-genetic effects of parity, year and season of calving affected ($P \leq 0.001$) all traits. Heritability estimates for TMY, 305-DMY, LP, DO and CI were 0.31, 0.34, 0.31, 0.03 and 0.04, respectively. Rank correlation computed between predicted breeding values among TMY, 305-DMY and LP were highly significant ($P \leq 0.001$) ranging from (0.40 to 0.89) showing that genetic improvement of one of the trait improve the rest of the traits. Genetic correlations ($r_g$) between milk and reproduce ability traits ranged from 0.001 to 0.078. Wide range of cows breeding value was found for most of the studied traits for TMY, 305-DMY, LP, DO and CI were 3278 kg, 2726 kg, 329.9 day, 10.2 day, and 48.9 day, respectively. Selection cows leads to high genetic improvement in the herd.*

***Keywords: Friesian, productive and reproductive traits, genetic parameters, government farm Egypt***

## INTRODUCTION

Milk production and reproducibility are important economic traits that form most of the income resources for dairy farmers worldwide.

The dairy industry in Egypt has undergone substantial changes during the last two decades (Rushdi *et al*., 2014). Generally, the increase in milk production can be achieved either by increasing number of milking cows or by improving milk production per animal through improving the environmental conditions, management practices and genetics make up of animals. The ultimate goal of any breeding program is the genetic improve to of the traits defined in the breeding model set for the dairy population. The traditional approach to achieve this is to select the superior animals to be parents for the next generation and among them to decide which should allowed to have the largest number of offspring (Strandberg and Malmfors, 2006). The genetic composition of the population, thereafter can be decided by evaluating of the residents the relative importance of heredity and environmental factors affecting the performance of that population (Goshu *et al*., 2014). In this regard, Knowledge of the heritability's values and phenotypic and genetic correlations between the traits are needed to calculate genetic merits, predict response to selection , help the producer to choose the right a breeding system to be adopted for future improvement (Cassell, 2001) and moreover, evaluate the breeding plan as well and to predict breeding values of the animals (Sahin *et al*., 2012).Animal model is currently the most that is factory statistical method to predict animal's breeding value (PBV) and their higher than of all available information from relatives taking into account the fixed effects and allowing comparisons among bulls, dams and cows based on breeding values(BVs) and comparison of cows across herds (Zahed *et al*., 2003).

The objectives of the present study were to: Predict the influence of sire and estimate the effect of some non-genetic factors on milk production traits such as total milk yield, 305-day milk yield and lactation period and reproductive traits such as days open and calving interval of Friesian cattle raised in Egypt, estimate genetic parameters (heritability, genetic and phenotypic correlations. and estimate cow, sire and dam breeding values.

## MATERIALS AND METHODS

### *The Source of data:*

Data used in the present study was obtained from the history sheets of lactation records of Friesian cattle maintained at El-Karada Experimental station, located in the northwest of the Nile Delta in Kafr El-sheikh governorate. This herd belong to the Animal Production Research Institute (APRI), Agricultural Research Center (ARC), Dokki, Giza, Egypt. A total number of 1976 normal lactation records of Friesian cattle over twelve consecutive years from 2007 to 2018 were used.

### *Feeding and management:*

Cows of that herd were kept under the regular system of feeding and management adopted by the Research Center, Ministry of Agriculture. Dried off cows were fed on Egyptian clover (berseem) (*Trifolium alexandrinum*) from November till mid-May. However, cows in milk grazed berseem from 10:00 a.m. to 2:00 p.m. and then were given rice straw at the rate of 4 kg/animal. concentrate mixture plus to cover about 60% of their requirements. In summer (mid-May to November), the animals were fed on concentrate mixture, rice straw and berseem hay if available. Concentrate supplementary ration contained at least 14-16% crude protein and 65 % total digestible nutrient.

### *Data collection:*

A summary of the data available for analysis in Table (1). The productive traits were total milk yield (TMY/kg), 305-Day Milk Yield (305-DMY/ kg) and Lactation Period (LP/day) and the reproductive traits were days open (DO/day) and calving interval (CI/day).

### *Data analysis:*

Data were analyzed using the general linear model (GLM) procedure (SAS, 2003) recording to the mixed model:

$$Y_{ijklm} = \mu + S_i + P_j + Y_k + SE_l + e_{ijklm}$$

Where:

$Y_{ijklm}$: either TMY, 305-DMY, LP, DO or CI

$\mu$= Population mean for each respective respective trait,

$S_i$= the random effect of $i^{th}$ sire,

$P_j$= the fixed effect of $j^{th}$ parity (j=1, 2… 7),

$Y_k$=the fixed effect of $k^{th}$ year of calving (k=2007…2018),

$SE_l$= the fixed effect of $l^{th}$ season of calving ( l=1, 2… 4),

$e_{ijklm}$ = random residual assumed to be independent normally distributed with mean zero and variance $\sigma^2$e.

### *Genetic parameters:*

Heritability and predicted breeding values (PBV) for all studied traits were estimated using single trait animal model (STAM). Multi-trait derivative-free restricted maximum likelihood MTDFRAML program of Boldman *et al*. (1995) obtained by REML method of VARCOMP procedure (SAS, 2003) was also realized the main fixed effects and interactions were tested and then removed from the model for being non-significant. The analytical model included fixed effects

**The model was : $Y = Xb + Z_1a + Z_2\ pe + e$**

Where,

Y: a vector of observations, b: a vector of fixed effects with an incidence matrix X, a and $p_e$: a vector of additive genetic and permanent environmental effect with incidence matrix $Z_1$; $Z_2$ and e: a vector of residual effects with mean zero and variance $\sigma^2_e$.

### *Predicted breeding values (PBV):-*

Best linear unbiased prediction (BLUP) PBV was calculated by back solution using the MTDFREML program for all animals in the pedigree file. Cow breeding values (CBVs) were producing using their own records, while dam and sire PBVs were obtained without own records.

### *Genetic correlation:*

Genetic correlations among PBV from (BLUP) rank correlation among ranks were estimated.

Phenotypic correlation among all traits under study were estimated

**Table 1. Summary of Data available for analysis**

| Item | Number |
|---|---|
| Records of productive traits | 1976 |
| Records of reproductive traits | 1648 * |
| Sires | 117 |
| Dams | 356 |
| Cows | 471 |

* Reproductive data were recorded from 2 nd parity and after

## RESULTS AND DISCUSSION

Means, standard deviation (SD) and coefficients of variation (CV %) for milk traits produce ability and reproduce ability of Friesian cows are in table (2). Milk traits are within the ranges reported in previous studies under similar conditions (Hussein *et al*., 2016 and Abo-Elenin, 2018). However, these means were relatively lower than those reported in other Egyptian studies on (Friesian) or Holstein cattle in commercial herds (Faid-Allah, 2015a; El-Awady *et al.,* 2016 and Sanad and Hassanane, 2017).

Despite of the appropriate over all mean of lactation period (310.08day), both TMY and 305-DMY were low (about 10kg / day) compared to the global standards (above 25 kg /day )probably due to low genetic potentials and unfavorable management factors Kapoor (2014) reported similar low milk production (7.1 kg /day) under Indian environmental conditions. However Sanad and Afifi, (2016) obtained high means of TMY and 305-DMY (4140kg and 3630kg, respectively) under intensive production systems for H- Friesian cows in Egypt. Rushdi *et al.* ( 2014) , Hussein *et al.* (2016) and Abo-Elenin (2018) obtained high milk production to the genetic makeup of the imported Friesian cows and to the fund management conditions under which cows made their lactation in Egypt.

The present mean of DO 148.71day was higher than that obtained by Shalaby *et al.* (2013) on Friesian cattle in Egypt (121day) and El-Awady *et al.* (2016) (120 day), but was slightly lower than (e.g. Faid-Allah, 2015 a, b) and El-Tarabanyand Nasr, 2015) (154-158 day)and much lower than those reported by Ayalew *et al.* (2017) and Abo-Elenin (2018) on commercial Holstein and Friesian cow 162-184.5 day. The present CI mean was 451 day within the ranges, reported in the Egyptian studies Sanad (2006) (452day) and Abo-Elenin, 2018 (445 day), but was higher than range of 401.1 to 438 day El-Tarabany and El-Bayoumi (2015) and El-Awady *et al.* (2016) and lower than 470 day Salem *et al.* (2006), 484 day (Ibrahim *et al*., 2009) and 472 day (Farrag *et al.,* 2017) Shalaby *et al*. (2001) and Hammoud *et al.* (2010) reported that the variation in the reproductive traits of Friesian cattle raised under Egyptian environmental may be due to the differences in management policies for breeding practices among Friesian herds in and/or to the poor experience in estrus detection which lead to delay fertile insemination and consequently increase CI. In this regard, Farrag *et al*., (2017). They attributed that to the poor nutrition, genetics and/or managerial conditions which load to lower cow fertility.

***Coefficients of variation:***

Variability for all studied traits as measured by CV% were high but within the ranges reported for Friesian cows in Egypt (El-Awady *et al.,* 2016; Sanad and Hassanane, 2017 and Abo-Elenin 2018). However, CV% reported by Afifi *et al*. (2002) and Salem *et al*. (2006) for TMY and 305 DMY (Sanad, 2006 and Hammoud, 2013) were lower ranging between 5.0 and 18.6 for milk production traits of Holstein commercial herd . The CV% values for DO and CI were surprisingly lower than those for milk yield but were within the ranges of the Friesian cows reported by Faid-Allah (2015a, b) , El-Awady *et al*., 2016 and Abo-Elenin, 2018.

Higher CV% are primary evaluation for the size of variation in the given trait of concern that could be utilized to improve the performance of Friesian cows in Egypt for milk and reproductively traits. Moderate CV% for CI and DO compared to milk production in the current study reflects high accuracy in estrus detection and low insemination.

**Table 2. Means, standard deviations (SD) and coefficients of variation (CV %) milk production and reproducibility traits of Friesian cattle.**

| Traits | Mean | SD | CV% |
|---|---|---|---|
| TMY | 3361.86 | 1199.54 | 35.68 |
| 305-DMY | 2939.08 | 1018.77 | 34.66 |
| LP | 310.08 | 113.04 | 36.45 |
| DO | 148.71 | 0.854 | 23.33 |
| CI | 451.03 | 2.60 | 23.48 |

***Non genetic factors effects** :*

Least-square estimates and significance of the factors affecting the studied traits are in table (3). The studied non-genetic factors affected most of milk production traits TMY, 305-DMY, LP, DO and CI ($P \leq 0.05$, $P \leq 0.01$ or $P \leq 0.001$) except season of calving on DO and CI which were not significant. Also parity and sire had non-significant effect on CI, similar to the results found by Ashour *et al.* (2014); Rushdi (2015) and Sanad (2016).

Sire revealed high significant ($P \leq 0.001$) source of variation for milk production traits indicating good the possibility of getting genetic progress selection throw, sire. Is in agreement Al-Samarai *et al.* (2015) and Sanad (2016).

The results year of calving affected on 305-DMY and LP ($p \leq 0.001$) and TMY ($P \leq 0.01$). The same trend was observed by Faid-Allah (2015a); Hussein *et al.* (2016); Salem and Hammoud (2016) and Abo-Elenin (2018). Also, Sanad and Afifi, (2016) noticed that parity and year of calving had significant effect on TMY and LP for Friesian cow raised in Egypt. Ihalem *et al*. (2012) reported significant effect of CI. Sanad (2016) reported a high effect on those traits except the effect on CI.

Year of calving also affected ($P \leq 0.001$) DO and CI. The same trend was observed by Hussein *et al.* (2016); Salem and Hammoud, (2016) and Abo-Elenin (2018) on different cattle breeders.

***Genetic aspects**:*

***Heritability estimates:***

Heritability ($h^2$), direct permanent environmental variance ($P_e$) and environmental variance (e) estimates of TMY, 305-DMY, LP, DO and CI are presented in (table 4). The current estimates were in similar ranges for Friesian cattle as those observed by Faid-Allah (2015a) El-Bayoumi *et al.* (2015); Al-Samarai *et al.* (2015) and Sanad (2016) whose estimates ranged from 0.22 to 0.35 for TMY, 0.25 to 0.36 for 305-DMY, 0.22 to 0.35 for LP, from 0.01 to 0.07 for DO and from 0.02 to 0.07 for CI.

Direct permanent environmental estimates were lower than those reported by Khattab *et al.* (2005) while were higher than those obtained by Sanad and Hassanane (2017) for TMY, 305-DMY and LP being 0.009, 0.00012 and 0.0049, respectively.

**Table 3. Least-squares analysis of variance of factors affecting milk and reproducability traits of Friesian cattle.**

| Item | No. | TMY (kg.) | 305-DMY (kg.) | LP (day) | No. | DO (day) | CI (day) |
|---|---|---|---|---|---|---|---|
| | | Means± SE | Means± SE | Means± SE | | Means± SE | Means± SE |
| Overall mean | 1976 | 3361.86±26.98 | 2939.08±22.91 | 310.08±2.54 | 1649 | 148.71±0.85 | 451.03±2.61 |
| **Year of calving** | | | | | | | |
| 2007 | 199 | 3399.2±82.53 | 2998.7± 67.69 | 317.88±8.87 | 161 | 153.13±2.87 | 452.29±9.29 |
| 2008 | 195 | 3795.6±80.19 | 3352.6±65.78 | 321.79±8.62 | 160 | 144.92±2.94 | 454.95±9.53 |
| 2009 | 194 | 3673.6±86.17 | 3166.3±66.62 | 309.77±8.73 | 153 | 150.95±2.93 | 444.63±9.48 |
| 2010 | 191 | 3519.8±83.14 | 3182.1±68.19 | 294.73±8.94 | 152 | 149.97±2.94 | 438.81±9.52 |
| 2011 | 187 | 3238.3±86.17 | 2888.6±70.68 | 313.48±9.26 | 147 | 155.93±2.93 | 482.30±9.49 |
| 2012 | 186 | 3633.6±89.67 | 3151.6±69.17 | 313.35±9.06 | 147 | 153.73±3.13 | 443.64±10.1 |
| 2013 | 164 | 2831.9±92.89 | 2510.6±76.19 | 322.40±9.98 | 143 | 131.87±3.17 | 463.93±10.2 |
| 2014 | 153 | 3827.7±89.67 | 3231.8±73.55 | 310.28±9.64 | 139 | 174.69±3.36 | 436.95±10.8 |
| 2015 | 146 | 2591.8±89.67 | 2200.9±82.50 | 310.28±10.81 | 125 | 145.56±3.68 | 475.86±11.9 |
| 2016 | 134 | 3080.8±106.1 | 2648.7±87.03 | 297.77±11.41 | 118 | 133.37±3.66 | 454.52±11.8 |
| 2017 | 123 | 2598.8±111.5 | 2160.6±91.51 | 300.69±11.99 | 102 | 131.15±4.33 | 402.63±13.9 |
| 2018 | 104 | 3837.9±108.2 | 3465.7±88.77 | 294.58±11.63 | 102 | 145.03±5.57 | 432.92±14.7 |
| **Season** | | | | | | | |
| Autumn | 538 | 3610.83±59.3 | 3211.04±48.65 | 306.26±6.44 | 449 | 147.46±2.16 | 450.45±6.93 |
| Winter | 534 | 3503.99±59.9 | 3047.40±49.15 | 319.41±6.37 | 406 | 151.32±2.16 | 454.78±6.98 |
| Spring | 479 | 3300.66±61.2 | 2877.20 ±50.22 | 313.76±6.62 | 431 | 149.80±2.18 | 452.17±7.37 |
| Summer | 425 | 3075.40±61.2 | 2669.02±50.55 | 301.98±6.584 | 363 | 146.24±2.28 | 447.03±7.37 |
| **Parity** | | | | | | | |
| 1 | 327 | 2932.64±68.13 | 2543.50±55.88 | 268.08±8.50 | 326 | 143.07±2.35 | 436.38±7.60 |
| 2 | 326 | 3027.92±68.31 | 2611.73±56.03 | 279.21±8.97 | 311 | 149.81±2.43 | 450.78±7.87 |
| 3 | 311 | 3245.94±70.76 | 2742.98±58.00 | 278.21±7.60 | 310 | 150.51±2.44 | 457.27±7.89 |
| 4 | 310 | 3367.89±70.71 | 2987.32±58.04 | 351.44±7.32 | 263 | 154.57±2.47 | 456.25±7.98 |
| 5 | 263 | 3823.55±83.50 | 3505.49±68.49 | 340.92±7.34 | 231 | 148.39±2.86 | 454.40±9.26 |
| 6 | 231 | 3751.03±79.13 | 3287.15±64.90 | 325.64±7.60 | 208 | 145.06±2.84 | 454.32±9.20 |
| 7 | 208 | 3732.45±73.73 | 3258.05±60.47 | 300.94±7.92 | 326 | 143.07±2.35 | 436.38±7.60 |

NS =not significant, *=P≤0.05, **=P≤0.01, *** = significant at P≤ 0.001

**Table 4. Habitability (h), (P) and error (e) for productive and reproducability traits of Friesian cattle**

| Traits | $h^2_a$ | Pe | E |
|---|---|---|---|
| TMY | 0.31±0.026 | 0.035±0.035 | 0.65±0.041 |
| 305-DMY | 0.34±0.028 | 0.005±0.030 | 0.64±0.041 |
| LP | 0.31±0.001 | 0.008±0.001 | 0.70±0.001 |
| DO | 0.03±0.002 | 0.004±0.0030 | 0.97±0.003 |
| CI | 0.04±0.001 | 0.0001±0.001 | 0.96±0.002 |

$h^2$= heritability, $P^2$ = Direct permanent environmental variance effect and e =residual variance.

***Genetic correlation :***

Unfavorable low positive non-significant genetic correlations were observed between milk and reproduce ability traits in (Table 5). Except between TMY and CI which was negative (-0.04), between LP and CI was significant (P≤ 0.05). Improving milk production of dairy cows is usually association with low fertility. Toghiani (2012a) and Shalaby *et al.* (2013) pointed to the unfavorable positive genetic associations between reproductive traits and milk yield traits (TMY, 305-DMY and LP). In the same trend, Tawfik *et al.* (2000) working on Friesian cattle reported that high-yielding cows and therefore have long CI tended to lactate for a long time. Contrarily, Hammoud (2013); El-Bayoumi *et al.* (2015) and Sanad and Gharib (2017a) represented negative genetic correlation between milk production traits and DO. Therefore special attention should be paid for cow fertility when selection is practiced for milk production.

However, Ojango and Pollot, (2001) and El-Bayoumi *et al*. (2015) claimed that the antagonistic relationship between TMY and CI (-0.64) and (-0.99), respectively were due to environmental factors rather than genetic. And they suggested that the genes that affect the milk production positively are likely not related CI. running on the same argument, Rearte *et al*. (2018) reported that, the magnitude of the relationship between milk yield and reproductive performance genetically is small, and depending mainly on level of herd production. All factors would cause correlations to be differ (Toghiani, 2012a).

**Table 5. Rank correlation between predicted breeding values of milk traits and reproducability (below diagonal) and phenotypic correlation between the some traits (above diagonal)**

| | TMY | 305-DMY | LP | DO | CI |
|---|---|---|---|---|---|
| TMY | | $0.720^{**}$ | $0.159^{*}$ | $-0.032^{ns}$ | $-0.011^{ns}$ |
| DMY | $0.898^{**}$ | | $0.025^{ns}$ | $-0.010^{ns}$ | $-0.012^{ns}$ |
| LP | $0.444^{**}$ | $0.423^{**}$ | | $0.04^{ns}$ | $0.039^{ns}$ |
| DO | $0.078^{ns}$ | $0.066^{ns}$ | $0.082^{ns}$ | | $0.247^{**}$ |
| CI | $-0.0452^{ns}$ | $0.001^{ns}$ | $0.160^{*}$ | $0.405^{**}$ | |

*= significant at P≤ 0.05, ** = significant at P≤ 0.01, ns = Non-significant

TMY = total milk yield, 305-DMY= 305-day milk yield, LP= lactation period , DO= days open and CI = calving interval.

***Phenotypic correlation coefficients:***

Phenotypic correlation coefficients ($r_p$) among milk production and reproductive traits are given in table 5 (above diagonal). All phenotypic correlations between productive traits (TMY, 305-DMY and LP), were positive. Strong positive $r_p$, very low but were negative with DO and LP.

Similar result were reported by (Sanad and Afifi, 2016; Sanad, 2016 and Sanad and Gharib, 2017a). Their estimates ranged from 0.08 to 0.85, from 0.14 to 0.75 and from 0.005 to 0.70 for TMY with 305-DMY, TMY with LP and 305-DMY with LP, respectively. On the other hand, low positive phenotypic correlations were observed between DO and CI. Similar results were mentioned by Hammoud (2013), El-Awady *et al.* (2017) and Abo-Elenin (2018).

Negative $r_p$ between TMY and 305-DMY with DO and CI, were also calculated by Faid-Allah (2015b) and Sanad and Gharib (2017a). However Antagonistic positive low result were obtained between LP and each of DO (0.04) and CI (0.03) in the present study, similar results were obtained by Sanad (2016); El-Awady *et al.* (2017); Abo-Elenin (2018) and Sanad and Gharib (2017a). Their $r_p$ values ranged from 0.001 to 0.006 between LP and DO, and from 0.05 to 0.08 between LP and CI, meaning less.

Also, Faid-Allah (2015 a and b) reported positive phenotypic correlations between TMY with DO, and between LP with DO and concluded that these traits could be improved simultaneously through multi-trait selection program, However, Faid-Allah (2015b) use the regard less of the small negative or positive correlation between 305-DMY and DO, between 305-DMY and LP but not between LP and DO.

***Breeding values (BV):***

Estimates of breeding values (EBVs) of cows, dams and sires for TMY, 305-DMY, LP, DO and CI are presented in table 6. The present results showed that, the ranges of BV of cows, sires and dams. The highest ranges of breeding values and accuracy were among cows followed by dams and the least were among sires.

The present results show large ranged of differences among breeding values of cows, sires and dams for different traits but cows, sires and dams with positive values for TMY and LP. Which indicated that, selection top cows for TMY were also positive for sires and dams will increase LP was decrease CI in next generation. El-Arian *et al*. (2002) and Sanad (2016) arrived at the same conclusion on Friesian cows. The high range of breeding values of cows compared to those of sires and dams may be due to using few numbers of proven sires compared to using large number of dam and cows and thus making good media for selection in dams and cows. Moreover, selection of cows for the next generation would lead to higher genetic improvement in the herd. The same trends were obtained by (Hammoud, 2013 and Sanad and Afifi, 2016).

The wide range of cows breeding values for a given trait indicate more genetic variation among that gives better chance for genetic improvement through selection of the superior cows according to breeding values. Selection cows on the basis of their breeding value for such traits would be more practical and then selecting them according to their sires or dams breeding values. The same results were referenced by El-Awady *et al*. (2016) and Sanad and Gharib, (2017a). With regard to DO , our ranges of cows BV, less than reported by Hammoud (2013), El-Bayoumi *et al*. (2015), Sanad and Gharib, (2017a) and Abo-Elenin (2018), respectively.

On the contrary, the range of BV for CI was higher than of most of those found under Egyptian conditions (El-Bayoumi *et al*., 2015; El-Awady *et al*., 2016 and Abo-Elenin, 2018) which ranged from 2.03-12.05 day.

The accuracy of prediction of minimum and maximum cow breeding values for studied traits ranged from 46 to 94%., which indicated that genetic improvement can be achieved through cows. Reached conclusion, Abo-Elenin (2018), although the accuracy for BV production for the same traits ranged from 00 to 87%.In this respect, Sanad (2006) presented that the accuracy for cow breeding values for 305-DMY, LP and CI ranged from 35 to 87%. Moreover, El-Awady *et al*. (2016) described accuracy of EBVs from 73-76, 73-77, 81-88 and 78-79% for 305-DMY, LP, CI and DO, respectively.

**Table 6. Range of estimated breeding values for cows, sires and dams, standard error (SE) and percentage of accuracy**

| | Cow EBVs | | | | |
|---|---|---|---|---|---|
| | Traits | | | | |
| | **TMY** | **305-DMY** | **LP** | **DO** | **CI** |
| Minimum | -1185 | -931 | -87.874 | -5.22 | -18.53 |
| SE | 430 | 360 | 12 | 5.6 | 11.3 |
| Accuracy% | 71 | 85 | 78 | 46 | 48 |
| Maximum | 2093 | 1795 | 242 | 5.027 | 28.79 |
| SE | 260 | 320 | 23 | 5.6 | 9.6 |
| Accuracy% | 91 | 94 | 81 | 85 | 83 |
| Range | 3278 | 2726 | 329.874 | 10.247 | 48.896 |
| | | | **Sire EBVs** | | |
| Minimum | -663 | -493 | -54.11 | -2.60 | -18.92 |
| SE | 520 | 450 | 9.8 | 6.2 | 9.2 |
| Accuracy% | 55 | 48 | 66 | 17 | 27 |
| Maximum | 1046 | 895 | 147.21 | 2.60 | 16.11 |
| SE | 540 | 480 | 11.1 | 5.6 | 7.48 |
| Accuracy% | 72 | 76 | 72 | 73 | 71 |
| Range | 1709 | 1346 | 201.32 | 5.20 | 25.03 |
| | | | **Dame EBVs** | | |
| Minimum | -1134 | -1066 | -66.27 | -4.082 | -16.32 |
| SE | 240 | 270 | 11.4 | 9.3 | 14.7 |
| Accuracy% | 92 | 71 | 48 | 66 | 55 |
| Maximum | 1041 | 748 | 129.17 | 4.014 | 15.63 |
| SE | 340 | 460 | 9.5 | 11.01 | 22 |
| Accuracy% | 84 | 85 | 88 | 82 | 83 |
| Range | 2175 | 1814 | 195.44 | 8.096 | 31.951 |

## CONCLUSIONS

Moderate estimates of heritability for milk traits, high range of breeding values estimates for (cows, sires and dames) with high accuracy.

The poor performance of cows for all traits in this study compared to their contemporaries in other equivalent herds under Egyptian conditions.

Explained through investigating the following items:

- Environmental influences, which showed a negative impact on the performance, especially for milk traits,
- How influential environmental factors to reduce the adverse impacted, along with improving farm management practices,

Genetic improvement through a well-organized plan for the use of animals with higher breeding values.

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## الآداء الإنتاجي والتناسلي للأبقار الفريزيان المرباة تحت الظروف المصرية

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هدفت هذه الدراسة الى تقدير المعالم الوراثية (المكافئ الوراثي، ومعامل الإرتباط الوراثي والمظهري بين الصفات والقيم التربوية) لقطيع أبقار الفريزيان المربي بمزرعة القرضا (مزرعة حكومية) الموجودة في محافظة كفر الشيخ ، وهى احدى المزارع البحثية التابعة لمعهد بحوث الانتاج الحيواني (APRI) مصر وتم استخدام ١٩٧٦ سجل على مدي ١٢ عامًا, وقد اشتملت الدراسة على صفات إنتاج اللبن (إنتاج اللبن الكلى بالكجم، إنتاج اللبن في ٣٠٥ يوم بالكجم ، وطول فترة الحليب بالأيام)، وبعض الصفات التناسلية (فترة الأيام المفتوحة والفترة بين ولادتين بالأيام).

تم حساب المعايير الإحصائية وتحليل التباين باستخدام برنامج **(SAS, 2003)** وفقاً للنموذج الخطي العام (GLM) وتضمن النموذج تأثير بعض العوامل الوراثية مثل الأب، وغير الوراثية مثل سنة الولادة، فصل الولادة، ترتيب موسم الولادة.

بينما تم تقدير المعايير الوراثية والمظهرية بنموذج الحيوان بواسطة برنامج (MTDFREML) وفقًا لـ (**Boldman *et al.* 1995**) لتقدير مكونات التباين والمكافئ الوراثي والقيم التربوية. وكذلك تم تقدير القيم التربوية المتوقعة لجميع الحيوانات (BV) عن طريق حساب أفضل تنبؤ خطي غير متحيز (BLUP) باستخدام برنامج MTDFREML.

أظهرت النتائج أن المتوسط لكل من أنتاج اللبن الكلي و إنتاج اللبن في ٣٠٥ يوم بالكجم وطول فترة الحليب باليوم ، فترة الايام المفتوحة ، الفترة بين ولادتين باليوم كان ٣٣٦١.٩ كجم ؛ ٢٩٣٩.١ كجم و ٣١٠ يومًا و ١٤٨.٧ يومًا و ٤٥١ يومًا، على التوالي .

أظهرت الدراسة وجود تأثير عالي المعنوية ($P \leq 0.001$) للطلوقة على جميع صفات الدراسة ، مما يتيح إمكانية الانتخاب لتحسين هذه الصفات من خلال الطلائق ، أيضا يوجد تأثير عالي المعنوية ($P \leq 0.001$) للعوامل غير الوراثية (ترتيب موسم الانتاج والسنة وموسم الولادة) على جميع صفات الدراسة.

بلغت قيم المكافئ الوراثي المباشر ($h^2_a$) لكل من أنتاج اللبن الكلي و إنتاج اللبن في ٣٠٥ يوم و طول فترة الحليب و فترة الايام المفتوحة و الفترة بين ولادتين ٠.٣١ و ٠.٣٤ و ٠.٣١ و ٠.٠٣ و ٠.٠٤ على التوالي.

الجزء الذي يمثل تأثير البيئة الدائمة الأثر للأمهات من التباين الظاهري كان ضئيلًا لكل الصفات، وتراوح من ٠.٠٠٠١ إلى ٠.٠٠٤.

معامل الارتباط الوراثى (والذى تم حسابه بين القيم التربوية المتوقعة) لكل من أنتاج اللبن الكلي و إنتاج اللبن في ٣٠٥ يوم و طول فترة الحليب كانت ذات أهمية كبيرة ($P \leq 0.001$) تراوحت بين (٠.٤ إلى ٠.٨٩). وهو ما يعني أنه عند التحسن الوراثي لأحد الصفات يتم التحسين الوراثي لباقي الصفات. بينما أظهرت النتائج وجود ارتباط وراثي موجب ضعيف بين معظم الصفات الإنتاجية والتناسلية و تراوحت قيم الارتباط بين ٠.٠٠١ إلى ٠.٠٧٨.

تراوحت القيم التربوية المقدرة (EBVs) لأبقار الفريزيان بين ٣٢٧٨ كيلوجرام لإنتاج اللبن الكلى، و ٢٧٢٦ كجم لإنتاج اللبن في ٣٠٥ يوم، و ٣٢٩.٨٧ يوم لطول فترة الحليب و ٤٨.٨٩ يوم للفترة بين ولادتين و ١٠.٢٤ يوم لفترة الأيام المفتوحة. أظهرت تقديرات المدى للقيم التربوية للأبقار ارتفاعها عن نظائرها للأباء والأمهات لذا ، توصي الدراسة بالانتخاب لأبقار الجيل القادم مما سيؤدي إلى تحسن وراثي مما ينعكس ايجابيا على الواقع الانتاجي لقطيع الدراسة.