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GENETIC AND PHENOTYPIC RELATIONSHIPS AMONG FIRST LACTATION TRAITS AND SOME LONGEVITY AND LIFETIME TRAITS IN FRIESIAN CATTLE.

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SUMMARY

Longevity and lifetime traits are favorable traits that affect overall profitability. The objectives of this study were to investigate the genetic and phenotypic relationships between first lactation traits and some longevity and lifetime traits in Friesian cattle, estimate genetic and phenotypic parameters for the same traits and estimate breeding values.

Data utilized included 2940 pedigree and performance records of Friesian cows born between 1980 and 2001 in Sakha and Alkarada Experimental Stations, Ministry of Agriculture and land reclamation (MOALR). The performance records covered the period from 1982 to 2008 for 853 cows, which had the opportunity to complete five productive years starting with the date of first calving. They were daughters of 104 sires and 689 dams.

Longevity and lifetime traits studied were total completed lactations (TCL), herd life (HL), productive life (PL), total lifetime 305-day milk yield (TL305MY), total lifetime milk yield (TLMY) and total lactation length in days (TLL). First 305-day milk yield (F305MY), first milk yield (FTMY) and first lactation length (FLL) were included in the analyses as first lactation traits.

Relationships between first lactation traits and each of longevity and lifetime traits were investigated. Fixed models have been applied to investigate the effects of non-genetic factors on the studied traits. Least squares means of the traits were 3.5, 99.1, 67.2, 8750.8 kg, 9888.7 kg, 1091.3 and 2358.4 kg for TCL, HL, PL, TL305MY, TLMY, TLL, and F305MY, respectively. Heritability estimates obtained from multiple-trait animal model analyses for the same traits were 0.03, 0.21, 0.20, 0.22, 0.30, 0.18 and 0.13, respectively.

Positive genetic correlation estimates were obtained between F305MY and each of all the longevity and lifetime traits (TL305MY, TLMY, TLL, TCL, HL and PL) being 0.46, 0.35, 0.49, 0.29, 0.11 and 0.22, respectively.

Estimates of rank correlation between F305MY and each of TCL, HL, PL, TL305MY, TLMY and TLL were positive and highly significant (P<0.0001) being 0.28, 0.17, 0.13, 0.40, 0.49 and 0.39, respectively.

Results of this study suggest that selection for high F305MY is expected to increase lifetime milk production, length of herd life and productive life. Also, including PL in a breeding program could be efficient.

Keywords: Longevity, lifetime, genetic parameters, breeding values and Friesian

INTRODUCTION

The cow is expected to produce a live calf without assistance and efficiently produce milk of desirable composition. Longevity reflects the ability of a cow to avoid being culled for low production, low fertility, or illness; (Vollema and Groen 1996). Also, longevity is a measure of the success of the cow to delay both voluntary and involuntary culling, (Ojango *et al*., 2005). Additionally, longevity depends on production during each lactation, length of productive life, and calving interval, (Novotný *et al*., 2017).

Longevity and lifetime milk production are among the traits of primary interest for dairy cattle breeders. The costs of rearing replacement cows represent a substantial part of the expenses in the dairy cattle production system. Reducing the proportion of culled cows reduces replacement heifer rearing cost, (Sewalem *et al*., 2008 and Jenko *et al*., 2015). Longer productive life may increase profits by increasing herd production through an increase in proportion of cows in higher-producing age groups, (Martinez *et al*., 2004).

Strategies for improving profitability need to focus on extending the productive life of the cow and reducing the costs associated with infertility and high replacement rates. Longevity traits generally are reported to be of low heritability estimates, therefore genetic improvement in longevity is difficult to achieve, (Tsuruta *et al*., 2005)

Although, lifetime milk production is one of the most important traits, direct selection for a high lifetime milk production is usually not applied in dairy cattle breeding programmes, (Jenko *et al*., 2015). Longevity and lifetime traits could be used in breeding programs if genetic parameters are known. Many countries include some measures of longevity in their national breeding objectives (VanRaden, 2002).

The relationships among early lactations' traits of moderate genetic correlations with longevity and lifetime traits have been considered for early prediction and selection process, (Jairath *et al.*, 1994 and Upadhyay *et al.*, 2015).

The objectives of this study were to investigate the genetic and phenotypic relationships between first lactation traits and some longevity and lifetime traits in Friesian cattle, estimate genetic and phenotypic parameters for the same traits and estimate breeding values.

MATERIALS AND METHODS

Data utilized in this study were obtained from two Friesian herds raised at Sakha and Alkarada experimental farms, which belong to the Animal Production Research Institute (APRI), Ministry of Agriculture and land reclamation (MOALR). Cows were fed mainly on berseem and rice straw. Also, cows were fed daily balanced ration and concentrates according to their production and weight. Cows were artificially inseminated using frozen semen and were automatic milking twice a day.

Data collection and editing:

A total of 6995 records were collected for this study. Only cows which had the opportunity to complete five productive years after the first calving date had been chosen, so data of those only born from 1980 to 2001 were collected. The productive years started from 1982 and ended by 2008. Cows with age at first calving less than 23.7 month or older than 42 month of age were excluded. Also, cows must begin their five productive years starting with the first lactation date, meaning that cows started with the second lactation were deleted. Lactation length records less than 90 days or higher than 500 days were deleted. Cows sold for breeding reasons were excluded from the data set. A total of 2940 records were remained presenting 853 cows, daughters of 104 sires and 689 dams.

Calculation of lifetime and longevity traits:

A cumulative amount for the 305-day milk yield, total milk yield and lactation length were summed up. Total number of completed lactations, productive life defined as the total number of months between first calving and disposal date and herd life which measured as the total number of months between birth and disposal date of the cow were calculated. Therefore, for each cow, there were first lactation traits; 305-day yield (F305MY), milk yield for the whole lactation (FTMY) and first lactation length (FLL). Lifetime and longevity traits utilized were total milk yield (TLMY), total 305-days milk yield (TL305MY), total lactation length (TLL), total number of completed lactations (TCL), herd life (HL) and productive life (PL).

Statistical Analyses:

First lactation traits :

The following model was applied to investigate the effects of fixed factors on the F305MY, FTMY and FLL traits:

$$Y_{ijkl} = \mu + H_i + R_j + S_k + (HR)_{ij} + (HS)_{ik} + (RS)_{jk} + (HRS)_{ijk} + b\,x_{ijkl} + e_{ijkl}$$

(Model I)

where,

Y_{ijkl} is the observation associated with the F305MY or FTMY or FLL, μ is the overall mean, H_i is the fixed effect due to the ith herd, i = 1,2, $\mathbf{R_j}$ is the fixed effect due to the jth year of calving, j = 1982,……,2004, S_k is the fixed effect due to the kth season of calving, k = 1, 2 for winter and summer, respectively, $(HR)_{ij}$ is the effect due to interaction between herd and year of calving, $(HS)_{ik}$ is the effect due to interaction between herd and season of calving, $(RS)_{jk}$ is the effect due to interaction between year and season of calving, $(HRS)_{ijk}$ is the effect due to interaction between herd, year and season of calving, b is a partial linear regression coefficient of the trait on the age of cow at first calving, x_{ijkl} is the deviation of age of cow at each record from the average age of cow, and e_{ijkl} is an effect due to a random error associated with each observation assumed to be normally and independently distributed with zero mean and variance $\sigma^2_{e.}$

Lifetime and longevity traits:

The following model was applied to investigate the fixed effects on the TL305MY, TLMY, TLL, TCL, HL and PL traits:

$$Y_{ijklm} = \mu + H_i + R_j + S_k + (HR)_{ij} + (HS)_{ik} + (RS)_{jk} + (HRS)_{ijk} + b_1 x_{1ijkl} + b_2\, x_{2ijkl\,ijkl} + b_3\, x_{3ijkl} + e_{ijklm}$$

(Model II)

where,

Y_{ijklm} is the observation associated with the TL305MY, TLMY, TLL, TC, HL and PL, μ is the overall mean, and the definitions of the rest of the terms are as those in model I except for: b_1 is a partial linear regression coefficient of the trait on the F305MY, x_{1ijkl} is the deviation of the cow record from the overall average of F305MY, b_2 is a partial linear regression coefficient of the trait on the FTMY, x_{2ijkl} is the deviation of the cow record from the overall average of FTMY, b_3 is a partial linear regression coefficient of the trait on the FLL, and x_{3ijkl} is the deviation of the cow record from the overall average of FLL,

Analyses for all fixed models were performed using the General Linear Model (GLM) for generalized least squares procedures of the Statistical Analysis System (SAS, 2002).

Estimation of genetic parameters and breeding values of longevity and lifetime production traits

Multiple-trait animal model analyses were performed to estimate co-variance components, genetic parameters and breeding values. Co-variance components and predicted breeding values (PBV) were obtained as the solution vector (u) of the random effects of the multiple-trait analysis. The analyses were solved iteratively and were terminated when the change in the variance of the function values (-2 log likelihood) was below 10^{-9} (Boldman *et al*., 1995). Multiple-trait derivative-free restricted maximum likelihood (DF- REML) with animal model analysis (Boldman *et al*., 2000) was used to apply the models. Two runs of 4-trait models were performed: Run1; includes F305MY with TL305MY,TLMY and TLL with the fixed effects of herd, year and season. Run2; includes F305MY with TCL, HL and PL with the same fixed effects. The applied model was:

$$\mathbf{y = X\beta + Zu + e}$$

with the following mixed model equations:

$$\begin{bmatrix} X'R^{-1}X & X'R^{-1}Z \\ Z'R^{-1}X & Z'R^{-1}Z+A^{-1} \end{bmatrix} \begin{bmatrix} \beta \\ u \end{bmatrix} = \begin{bmatrix} X'R^{-1}y \\ Z'R^{-1}y \end{bmatrix}$$

where,

y is the matrix of observations of F305MY, TL305MY, TLMY, and TLL or F305MY, TCL, HL and PL, X is the incidence matrix that associates the fixed effects to the observations, β is the vector of fixed effects including herd, year and season of calving, Z is the incidence matrix that associates random effects to theobservations, u is the vector of animal random effects, and e is the vector of random residual effects associated with each observation.

Spearman rank correlation coefficients among breeding values of the first lactation 305 milk yield (F305MY) and TLL, TLMY, TL305MY, PL, TCL and HL were estimated using the Statistical Analysis System (SAS, 2002).

RESULTS AND DISCUSSION

Table (1) summarizes the least squares means and coefficient of variation (C.V.) for first lactation traits, longevity and lifetime traits. Significance probabilities for the main effects that included in the fixed analyses are also shown in Table (1). Interaction between herd and year was highly significant in all first lactation and longevity traits except for HL and PL. On the contrary, the herd-season interaction was not significant in all the studied traits. Also, the season-year interaction and the herd-year-season interaction was not significant in all traits except for F305MY and FTMY.

Least squares means of F305MY and FTMY (2358.4 and 2640.4) are lower than the estimates reported on the same herds by Abubakr *et al*. (1998), Farrag *et al*. (2000) and Abdelharith (2008), but higher than estimates reported by Halawa (2007) also on the same herd. Applying some constraints on the data set such as determining age at first calving or choosing cows that completed five productive years could result in these differences.

For the longevity and lifetime production traits; TCL, HL and PL least squares means of 3.5 lactation, 99.1 month and 67.2 month, respectively, are higher than those revealed by Halawa (2007) and Khattab *et al*. (2009) on the same herd. Ashmawy (1985a) reported a TCL estimate of 2.77 on British Friesian Holstein herd that completed 5 lactations. Abou-Bakr (2009) on a commercial herd obtained lower HL (74.8) and PL (47.5) with reported high milk production. High producer cows often reach high production in lower TCL, (Gugger *et al*., 2007) and this might explain the differences in estimates.

Least squares means for TLMY and TLL of 9888.7 kg and 1091.3 days are higher than those estimated by Halawa (2007; 8831 kg and 1074 days) and the estimated TLMY (9670 kg) by Khattab *et al*. (2009), on the same herd; but lower than the estimates reported by Atil and Khattab (1999) of 25423 kg and 1538 days for Holstein Friesian herd in a commercial farm. These differences in estimates could be attributed to the breed differences and management practices with culling policies.

Table 1. Least squares means (LSM) and their standard errors (SE), coefficient of variation (C.V.%) and probability of significance of first lactation traits; longevity and lifetime traits

Trait	N	LSM ± SE	C.V%	Prob>F		
				Herd	Year	Season
F305MY	853	2358.4±465.59	25.8	0.00	0.00	0.41
FTMY	853	2640.4±613.26	30.4	0.00	0.00	0.99
FLL	853	332.8±56.16	21.4	0.00	0.00	0.44
TCL	853	3.5±0.81	29.2	0.75	0.00	0.99
HL	853	99.1±23.52	30.9	0.00	0.00	0.98
PL	853	67.2±23.71	46.8	0.00	0.00	0.89
TL305MY	853	8750.8±2504.65	35.7	0.00	0.00	0.91
TLMY	853	9888.7±2965.25	37.0	0.23	0.00	0.73
TLL	853	1091.3±273.87	31.4	0.80	0.00	0.71

F305MY: First 305-day milk yield, FTMY: first milk yield, FLL: first lactation length, TCL: total completed lactations, HL: herd life, PL: productive life, TL305MY: total lifetime 305-day milk yield, TLMY: total lifetime milk yield and TLL: total lactation length in days.

Partial regression coefficients of longevity and lifetime production traits on first lactation traits are presented in Table (2). Positive and significant regression coefficient of TL305MY on F305MY (0.87) reveals that high F305MY may result in high TL305MY for the cow. Ashmawy (1985b) reported negative regression coefficients of stayability for the second and third lactations on FTMY.

Negative non-significant estimates of regression coefficients of TLMY and TLL on F305MY (-0.31 and -0.02), indicate that higher production of F305MY leads to shorter TLL with decrease in TLMY. Estimates of regression coefficients of TLMY on FTMY and TLL on FLL were positive and significant indicating that increasing FLL and FTMY will be accompanied by longer TLL and higher TLMY.

Table 2. Partial regression coefficients of longevity and lifetime production traits on first lactation traits and their standard errors and (P<F) between brackets

Trait	F305MY	FTMY	FLL
TL305MY	0.87±0.35	0.69±0.33	-2.21±2.28
	(0.01)	(0.04)	(0.33)
TLMY	-0.31±0.41	2.22±0.38	-4.87±2.67
	(0.45)	(0.00)	(0.07)
TLL	-0.02±0.04	0.05±0.04	0.73±0.25
	(0.66)	(0.16)	(0.00)
TCL	0.00±0.00	0.00±0.00	0.00±0.00
	(0.86)	(0.80)	(0.07)
HL	0.00±0.00	0.01±0.00	0.02±0.02
	(0.77)	(0.82)	(0.02)
PL	0.00±0.00	0.00±0.00	0.02±0.02
	(0.82)	(0.89)	(0.45)

F305MY: First 305-day milk yield, FTMY: first milk yield, FLL: first lactation length, TL305MY: total lifetime 305-day milk yield, TLMY: total lifetime milk yield, TLL: total lactation length in days, TCL: total completed lactations, HL: herd life and PL: productive life.

Zero and non-significant regression estimates of TCL, HL and PL on F305MY, FTMY and FLL except for HL on FLL, were significant, indicating that changes of the studied first lactation traits would not result in any changes in TCL, HL nor PL. Positive partial regression coefficient of HL on FTMY was reported by Honnette *et al.* (1980).

Table (3) summarizes estimates of additive, environmental and phenotypic variances obtained from the multiple-trait animal model runs. Also, estimates of heritability are shown in the same Table. In all the studied traits, the environmental variance is higher than the genetic one. This could explain the importance of the management practices as well as the genetic effects of these traits. Jenko *et al.* (2015) reported similar result for first total milk yield trait. The heritability estimate of F305MY (0.13) is smaller than that reported by Halawa (2007) on the same herd and than of Jairath *et al.* (1995), Vollema and Groen (1996), Atil and Khattab (1999) and Jenko *et al.* (2015). The differences among estimates could be referred to different models applied and data structures.

Table 3. Additive genetic, environmental and phenotypic variances; heritability (h^2) and their standard error (SE) for first lactation, longevity and lifetime traits.

Trait	Additive genetic variance	Environmental variance	Phenotypic variance	h^2±SE
F305MY	55926.80	372849.20	428776.00	0.13±0.06
TL305MY	2400997.50	8355977.60	10756975.10	0.22±0.08
TLMY	4663919.40	11527776.10	16191695.40	0.30±0.08
TLL	24209.30	102590.00	126799.30	0.18±0.07
TCL	0.025	0.93	0.95356	0.03±0.06
HL	103.81	398.49	502.29	0.21±0.07
PL	101.82	405.33	507.15	0.20±0.07

F305MY: First 305-day milk yield, TL305MY: total lifetime 305-day milk yield, TLMY: total lifetime milk yield, TLL: total lactation length in days, TCL: total completed lactations, HL: herd life and PL: productive life.

Estimates of heritability for TL305MY, TLMY and TLL were 0.22, 0.30 and 0.18 as shown in Table 3. Reported estimates higher than 0.20 for TLMY were obtained by Atil and Khattab (1999), Halawa (2007), Khattab *et al.* (2009), Abou-Bakr (2009) and Upadhyay *et al.* (2015). Other low estimates were reported by Jairath *et al*. (1995), Vollema and Groen (1996), Zahed *et al*. (2004) and Jenko *et al*. (2015). The resulted heritability estimates show that selection with improved management could bring noticeable improvement in these traits.

The estimate of heritability for TCL (0.03) is in agreement with that reported by Ashmawy (1985a), Vollema and Groen (1996) , Zahed *et al*. (2004) of (0.022, 0.036 and 0.04, respectively). Low estimates of heritability for TCL were also reported by Novotný *et al*. (2017) and Stanojević (2017), (0.06 and 0.074), respectively. The low heritability estimates resulted from small additive variance and therefore management practices affect TCL trait more than the genetics. Higher estimates for TCL were reported by Halawa (2007), (0.25) and Khattab *et al*. (2009), (0.12). The low heritability estimate of TCL suggested that selection for longevity measured as TCL could be ineffective.

Although HL and PL traits are considered as managerial decisions and their heritability estimates in general are low ranging from 0.037 to 0.136 and from 0.035 to 0.136, respectively (Hoque and Hodges (1980); Jairath *et al*. (1994); Vollema, and Groen (1996) and Jenko *et al*. (2015); estimates of heritability for these traits (0.21 and 0.20) are within the range of estimates obtained in Egypt by Halawa (2007) and Khattab *et al*. (2009). Lower estimates of heritability for PL were reported by Upadhyay *et al*. (2015) and Stanojević (2017), (0.17 and 0.066, respectively). This wide range of estimates might be due to the different types of data and different models of analyses.

Tables (4) and (5) show the genetic and phenotypic correlations between F305MY and each of lifetime and longevity traits resulted from the multiple-trait animal model analyses. Positive moderate genetic correlations were obtained between F305MY and each of TL305MY, TLMY and TLL (0.46, 0.35 and 0.49, respectively). The corresponding phenotypic correlations between F305MY and both of TL305MY and TLMY were positive and moderate (0.34 and 0.37). These estimates were within the range of estimates obtained by Halawa (2007) and in agreement with Hoque and Hodges (1980) and Jairath *et al*. (1995). Jenko *et al*. (2015) which they reported a phenotypic correlation estimate of 0.27 between first milk yield and total milk yield and 0.48 for the genetic correlation between them. The positive correlations indicate that cows of higher F305MY is expected to produce higher TL305MY and TLMY.

High positive genetic and phenotypic correlations between lifetime traits TL305MY and TLMY are presented in Table (4) being 0.99 and 0.95, respectively. The genetic correlations between TLL and each of TL305MY and TLMY were 0.99 and 0.98 while corresponding phenotypic correlations were smaller (0.89 and 0.90), respectively. These high genetic correlation estimates indicate that improving of one trait will lead to improvement in the other traits.

Table 4. Estimates of genetic (below diagonal) and phenotypic (above diagonal) correlations between F305MY and each of TL305MY, TLMY and TLL in Friesian cattle

	F305MY	TLL	TLMY	TL305MY
F305MY		0.14	0.37	0.34
TLL	0.49		0.90	0.89
TLMY	0.35	0.98		0.95
TL305MY	0.46	0.99	0.99	

F305MY: First 305-day milk yield, TLL: total lactation length in days, TLMY: total lifetime milk yield and TL305MY: total lifetime 305-day milk yield.

Table 5. Estimates of genetic (below diagonal) and phenotypic (above diagonal) correlations between F305MY and each of TCL, HL and PL

	F305MY	TCL	HL	PL
F305MY		0.27	0.25	0.12
TCL	0.29		0.42	0.41
HL	0.11	0.55		0.99
PL	0.22	0.51	0.99	

F305MY: First 305-day milk yield, TCL: total completed lactations, HL: herd life and PL: productive life.

Positive genetic and phenotypic correlations between F305MY and longevity traits ranging from 0.11 to 0.29 are presented in Table 5. In general, the genetic correlations were higher than the corresponding phenotypic correlations except for the correlation between F305MY and HL. The genetic correlation between F305MY and PL, was positive and moderate, (0.22) while the phenotypic correlation between them was 0.12. Jenko *et al*. (2015) reported 0.23 and 0.05 for the same correlations, respectively. On a British Friesian-Holstein herd, Ashmawy (1985 a) reported a higher genetic correlation (0.42) than that reported in this study. It could be concluded that higher F305MY cows will be expected to have higher PL and remain longer in the herd. This is in agreement with Hoque and Hodges (1980) and Atil and Khattab (1999).

The genetic correlation between TCL and each of HL and PL (0.55 and 0.51), respectively were higher than the corresponding phenotypic correlation, (0.42 and 0.41). Among the genetic and phenotypic correlations, HL and PL had the same high positive genetic and phenotypic correlation estimate of (0.99). Zahed *et al*. (2004) and Halawa (2007) reported an estimate of (1.0) for both genetic and phenotypic correlation. The PL trait is reported to be recommended in breeding programs by Reinhardt and Pasman (1996), VanRaden (2002) and Martinez *et al*. (2004).

Table (6) presents the spearman rank correlations between predicted breeding values among first lactation trait (F305MY) and longevity and lifetime traits. Predicted breeding values for F305MY ranged between -902 to 1189 kg. The estimates of breeding values for TCL ranged from -0.20 to 0.22 lactation, for HL, ranged between -13.9 and 21.0 month and for PL ranged from -15.5 to 25.1 month. The wide variation of the breeding values estimates suggested that an appropriate breeding scheme would expect response to selection for these traits. Vast ranges of breeding values for first lactation traits and lifetime traits were reported by Atil and Khattab (1999) and Khattab *et al*. (2009).

Table 6. Spearman rank correlation coefficients between breeding values of the first lactation and each of longevity and lifetime traits.

	F305MY	TLL	TLMY	TL305MY	PL	HL
TCL	0.28	0.35	0.34	0.35	0.77	0.76
HL	0.17	0.25	0.21	0.24	0.99	
PL	0.13	0.25	0.23	0.25		
TL305MY	0.40	0.99	0.99			
TLMY	0.49	0.99				
TLL	0.39					

F305MY: First 305-day milk yield, TCL: total completed lactations, HL: herd life, PL: productive life, TL305MY: total lifetime 305-day milk yield, TLMY: total lifetime milk yield and TLL: total lactation length in days.

Low to moderate positive rank correlations between predicted breeding values of F305MY and all the lifetime traits ranging from 0.13 to 0.49 were obtained. Zahed (2004) obtained the same findings but in different estimates of correlations. Positive correlation estimates between F305MY and TLMY were also reported by Atil and Khattab (1999).

Among the traits, the highest rank correlation (0.99) was found between HL and PL. This high correlation could be expected as PL is a part of HL. Same conclusion applied on the high rank correlations between TLL and TL305MY (0.99) and between TLL and TLMY (0.99) as TL305MY and TLMY is a function of TLL. These results are in agreement with Zahed *et al*. (2004) and Dubey and Singh (2014).

The highest positive rank correlation estimates between TCL and each of the lifetime and longevity traits were between TCL and HL (0.76) and between TCL and PL (0.77).

CONCLUSIONS

Results of this study suggest that selection for high 305-day milk yield in the first lactation is expected to increase lifetime milk production, length of herd life and productive life. Genetic improvement of longevity or lifetime traits could be practicing indirectly depending on traits of the first lactation. Including the productive life or any of the longevity traits in a genetic evaluation or breeding program could be useful. The early selection based on the first lactation traits is useful to minimize the generation interval and thus maximize the genetic progress.

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العلاقات الوراثية والمظهرية بين صفات الموسم الأول و بعض صفات الحياة الإنتاجية فى أبقار الفريزيان

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تعتبر صفات الحياة الإنتاجية من الصفات المفضل دراستها حيث أنها تؤثر على الربحية الإجمالية. كانت أهداف هذه الدراسة هي دراسة العلاقات الوراثية والمظهرية بين صفات الموسم الأول و بعض صفات الحياة الإنتاجية في الماشية الفريزيان ، وتقدير المعالم الوراثية والمظهرية لنفس الصفات وتقدير القيم التربوية. اشتملت الدراسة على ٢٩٤٠ سجل لأبقار الفريزيان المولودة فى الفترة من ١٩٨٠ و حتى ٢٠٠١ بمحطتى سخا والقرضا التابعتين لمعهد بحوث الانتاج الحيوانى بوزارة الزراعة بمصر. واشتملت هذه السجلات على البيانات الانتاجية للفترة من ١٩٨٢ و حتى ٢٠٠٨ و ذلك ل ٨٥٣ بقرة بنات ل ١٠٤ طلوقة و ٦٨٩ أم وأتيحت لهم فرصة الوجود بالقطيع لمدة ٥ سنوات انتاجية بدءا من تاريخ أول ولادة لها.

تم استخدام بعض صفات الحياة الانتاجية فى التحليل الإحصائى مثل عدد المواسم ، طول الحياة فى القطيع ، الحياة الانتاجية ، إنتاج اللبن فى ٣٠٥ يوم فى خلال ال٥ سنوات، انتاج اللبن الكلى خلال ٥ سنوات انتاجية ، وعدد أيام الحلب أيضا فى نفس الفترة باليوم. استخدم أيضا فى التحليل بعض صفات الموسم الأول كانتاج اللبن فى ٣٠٥ يوم للموسم الأول وانتاج اللبن الكلي لأول موسم و طول فترة حليب أول موسم .

درست العلاقات بين صفات الموسم الأول و صفات الحياة الانتاجية. واستخدمت نماذج احصائية ثابتة لدراسة تأثير بعض العوامل غير الوراثية على هذه الصفات. كان متوسط الصفات ٣.٥، ٩٩.١ ، ٦٧.٢، ٨٧٥٠.٨ ، ٩٨٨٨.٧ ، ١٠٩١.٣ ، ٢٣٥٨.٤ و ذلك للصفات عدد المواسم ، طول الحياة ، طول الحياة الانتاجية ، انتاج اللبن المجمع ل ٣٠٥ يوم ، انتاج اللبن الكلى ، عدد أيام الحليب و انتاج اللبن فى ٣٠٥ يوم للموسم الأول.

استخدم نموذج الحيوان متعدد الصفات لتحليل الصفات المدروسة و كانت تقديرات المكافئ الوراثى هى ٠.٠٣، ٠.٢١، ٠.٢٠، ٠.٢٢ ، ٠.٣٠، ٠.١٨ و ٠.١٣ لنفس الصفات على التوالى.

أما تقديرات الارتباط الوراثى بين انتاج اللبن فى ٣٠٥ يوم للموسم الأول وجميع صفات الحياة الانتاجية تحت الدراسة فكانت موجبة وقدرت ٠.٤٦ ، ٠.٣٥ ، ٠.٤٩ ، ٠.٢٩ ، ٠.١١ ، ٠.٢٢ على التوالى.

أجرى ارتباط الرتب بين القيم التربوية لجميع الصفات المدروسة ووجد أن معاملات ارتباط الرتب بين صفة انتاج اللبن فى ٣٠٥ يوم للموسم الأول وبين صفات عدد المواسم ، طول الحياة ، طول الحياة الانتاجية ، انتاج اللبن المجمع ل ٣٠٥ يوم ، انتاج اللبن الكلى ، عدد أيام الحليب الكلية ، موجبة وعالية المعنوية و كانت تقديراتها ٠.٢٨ ، ٠.١٧ ، ٠.١٣ ، ٠.٤٠ ، ٠.٤٩ ، ٠.٣٩ على التوالى.

أظهرت النتائج فى هذه الدراسة أنه يمكن الانتخاب لإرتفاع إنتاج اللبن في ٣٠٥ يوم للموسم الأول حيث يتوقع الزيادة فى كمية اللبن الكلية لحياة الابقار وكذلك صفة طول فترة الحياة الانتاجية . أيضا يمكن الاستفادة من ادراج صفة طول الحياة الانتاجية فى برامج التربية.