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Estimation of Genetic and Phenotypic Parameters for Growth Traits of Friesian Cattle Raised in Egypt.

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ABSTRACT

Growth traits (GT) of 1691 Friesian calves by 74 sires and 789 dams over a 20 years (1997 to 2016) in Alkarda Farm, Egypt. Traits studied were weight at birth weight (BW), weaning weight (WW) and daily gain (DG). Records were analyzed *Multiple Trait Likelihood* (MTDFREML) to estimate covariance components and Heritability(h^2), genetic correlations(r_G) , maternal correlations (r_m) and phenotypic correlations(r_P), breeding values(BV), and Epigenetic trend (EGT)for growth traits (GT) of Friesian cattle raised in Egypt. Actual mean for BW,WW and DG were 28.6kg, 92.6kg and 0.60 gm , respectively. Direct heritability (h^2_a) estimates for BW, WW and DG were 0.32±0.06, 0.22±0.06 and 0.34±0.85, respectively; on the same time low maternal heritability (h^2_m) were 0.12±0.35, 0.08±0.49 and 0.18±0.71, respectively. The permanent environment (P^2) was 0.021±0.70, 0.030±0.77 and 0.058±0.72 for BW, WW and DG, respectively. Phenotypic correlation (r_P) were 0.99m while, direct genetic correlation (r_g) are ranged from 0.56 to 0.96.While, maternal correlations (r_m) ranged from were 0.48, to 0.93. Rang of breeding value (BV) estimated of calves for BW, WW and DG were 51.5kg, 10.1kg and 31.2 kg , the BV of sire for the same traits 17.7 kg, 101.0kg and 12.0g. While the range of dams BV were 11.4kg, 17.8kg and 17.7gm respectively. The results showed that it is better to choose on the basis of the BV of calves to obtain highly genetic improvement. Generally the direction was (EGT) positive in the autumn and summer 'while it was negative in the winter and spring of the studied traits. In addition, the estimated genetic trends of Epigenetics that the genetic performance of cows is affected by the exist environmental conditions, as the influence of the season, parity and year, which has shown an impact at some levels, so, sufficient care is necessary help them to rapid their full genetic possibility by improving environmental conditions Inappropriate. This results in animals showing their full genetic potential for GT, thus increasing the efficiency of selection. We conclude from this study: Improve the performance of the animal under study by estimating the environmental and genetic factors and knowing their impact on growth performance, which will allow them to set standards for assessing the performance of the animals. The traits under study are high to medium in the values of genetic equivalence. The genetic correlations between the characteristics of the study are positive and high. The direct genetic and permanent effects are more effective in the selection process. The results show that all traits of growth have a clear potential for improved yield through direct genetic selection and more attention to environmental conditions through good care and selection based on breeding values. This results in animals showing their full genetic potential for growth traits, thus increasing the efficiency of selection.

Keywords: Friesian, Growth traits (GT), Animal model, Genetic parameters, Epigenetics TREND (EGT), Calves.

INTRODUCTION

Genetic improvement is necessary factor for economically of dairy cattle, also it's important to improve milk traits Sarakul *et al* (2011).

Apart from the genotype effects; sex, year of birth and parity were the main non genetic factors that influenced growth and daily weight gain traits until one year of age (Abera *et al*., 2012). Therefore, the actual performance of animals could be adjusted by removing non-genetic sources of variation from the performance data to get accurate estimates of genetic parameters and breeding values.

A genetic trend is defined as a change in performance per unit of time due to change in mean breeding value and it is derived by comparing the average levels in the cow populations for each year. The understanding of trends in genetic progress will help future genetic direction to be established by definition of specific goals for breeding a profitable.

Therefore in any genetic improvement program, there is the need of tracking the results to evaluate their progress, to make adjustments aiming to optimize genetic gain, and to increase farm profitability in the future. One of the ways to perform such monitoring is through the assessment of genetic trends over time, which evaluates the changes brought by the selection process (Silva *et al.,* 2001).

This study aims to estimate the genetic effects of the traits) BW, WW, DG) . Moreover, the study attempted to estimates of BV for all traits, by using analysis MTDFREML, estimate Epigenetics trend (EGT) and environmental trend by determine the effects of various environmental factors on the traits study of Friesian calves raised under Egyptian farm condition.

MATERIALS AND METHODS

Population.

The study was conducted on the calves of Alkarda farm, Kafr El-Sheikh, Egypt. Calves were were allowed to suckle their dam's colostrum's (the first three days) after birth. Each calf was given 500 kg of milk during the feeding period. Plus availability alphalpha fresh hay, nutrition plan was according to the system of (APRI).

Data collection and traits.

The data used in this study were taken from the collected records of APRI during the period of 1997-2016. Data were extracted from various growth records (BW and WW) of Friesian cattle raised in Egypt. Table (1): show structure of data.

Table 1. data used in the study

Items	Number
Sire	74
Dam	789
Animals weaned	1691
Total number of animals in the pedigree record	2543

Data analysis.

Data were analyzed using multi-trait animal model for three traits (birth weight, weaning weight and daily gain). Heritability, genetic correlations, phenotypic correlations and BV of studied traits were estimated with derivative-free restricted maximum likelihood (REML) procedures using the *MTDFREML* (Boldman *et al.,* 1995). Also *(SAS, 2003)*.

The model was:

$$y = Xb + Z_1a + Z_2m + Z_3p + e ,$$

Cov (a,m)= A $\sigma_{a,m}$ where,

y: a vector of observations, b: a vector of fixed effect, a, m, p and e are the vectors of direct additive genetic effect, maternal genetic effect, permanent environmental effect and the residual effect, respectively, X, Z_1, Z_2 and Z_3 are incidence matrix relating individual records to b, a, m and p, respectively.

Epigenetic Trend (EGT):

Genetic improvement of cattle for economically important traits, particularly growth traits, is an important component of an overall strategy to improve milk traits of cows. Factors that influence genetic improvement may vary across environmental situations. Differences among such as (season, parity and year) (Hassan *et al* 2010 and 2013).The cumulative effects of such genes, coupled with environmental effects produce continuous variation in the phenotypic values of individual .The differences among classes of distinctive environmental situations may affect growth traits genetic improvement within cattle populations, and will help identify common factors that influence genetic improvement across populations in Friesian cattle raised in Egypt.

EGT was estimated using the method procedures Legates and Myers (1988). Environmental using (SAS, 2003), The resultant output was then plotted in graphs to represent the general trend of the behavior of the fixed effect under consideration (parity, year and season).

Environmental Trend (ENV)

ENV are estimated as the result of subtracting BV of growth traits (GT) values of an animal from its observed phenotypic values of the GT , all as deviations from the means, the resultant values are regressed matching their respective parity, season, and year effects as done with EGT. They evaluated by the same way done with EGT.

RESULTS AND DISCUSSION

(Table.2) Means for BW, WW and DG were 28.6, 92.6 and 0.60 kg., respectively. Mean of BW lower than those reported by Hullya Atil et al., (2005) (31.8 kg) and higher than Hwang *et al* (2008) (24.4 kg).while Mean of WW higher than While, Hwang *et al.,* (2008) (91.77 kg) and lower than Hulya Atil *et al.,* (2005) (97.4 kg).

Table 2. Actual Means(X) , standard deviation (S.D) and coefficients of variation (CV%) for GT in Alkarda farm.

Traits	X	S.D	C.V%
BW,kg	28.6	3.2	11.1
WW,kg	92.6	11.2	12.1
DG, gm.	0.60	0.10	17.5

The coefficient of variation for BW, WW and DG were 11.1, 12.1 and 17.5 % respectively. Hullya Atil *et al* (2005) estimates for BW and WW were 14.4 and 10.5 Hwang et al., (2008) found that BW and WW were 15.3 and 22.0. Differences between the results of this study and the results of previous research may be due to differences in the methods of statistical analysis or the number of records used or due to different management and ways of care.

Genetic parameters

Heritability estimates.

Estimation of heritability (direct (h^2_a) and maternal ($h^2_{m)}$) of BW, WW and DG are presented in Table 3. Estimates of (h^2_a) were Moderate and were 0.32, 0.22 and 0.34, respectively. While, (h^2_m) were 0.12, 0.08 and 0.18 respectively. in Table 3.

Table 3 .Heritability estimates (h^2_a± SE) and (h^2_m ± SE), (P^2± SE), and error (e^2) for GT.

Traits	h^2_a±SE	h^2_m±SE	P^2±SE	e^2
BW	0.32±0.06	0.12±0.35	0.021±0.70	0.46
WW	0.22±0.06	0.08±0.49	0.030±0.77	0.57
DG	0.34±0.85	0.18±0.71	0.058±0.72	0.30

h^2_a = additive heritability ,h^2_m = maternal heritability ,p^2 = Direct permanent environmental variance effect, e =residual variance ., (BW)= weight at birth, (WW)= weight at weaning and (DG)=daily gain.

Moderate heritability for body weight and gains obtained in the present study were similar Dodenhoff *et al.* (1999) ranged from 0.17 to 0.33

In this results higher than Keeton *et al.* (1996), found that estimates (h^2_a) WW and (h^2_m) WW were 0.25 and 0.19, respectively. Hulya Atil *et al* (2005) found that the estimates ofh^2_a BW and WW were (0.28) and 13 respectively ,while, h^2_m of WW were 0.06, but, lower than results of Maarof *et al.* (1988) (0.43) ; Goyache *et al.* (2003) found h^2 of WW was 0.67. The estimates of WW is similar Lengyel *et. al.* (2001),

Koch *et al.,* (1994), Waldron *et al.,*(1993) and Lee and pollak.,(1997) reported maternal heritability estimate of WW were 0.17, 0.14 and 0.15, respectively, in beef cattle which are not also far from what has been reported from our study. However the present estimateson maternal heritability coincide with others reported in literature (Berweger Baschmagel *et al.,* (1999) (0.04) ; Lee and pollak.,(1997) (0.09).

As shown from Table.3 WW (0.22) rather than BW (32), however, higher estimate of(h^2_m) for BW (0.12) than WW (0.08) indicating that h^2_m genetic effects for BW Similar to results obtained by (Lengyel *et al.* 2001) low of h^2 for WW may be dam effect. (Maternal effect) Heritability estimates observed for BW indicated that in Friesian faster genetic improvement through selection is possible for BW and WW.

The estimates of h^2_a and h^2_m for WW were 0.22 and 0.08 (Table.3) were highest estimate obtained Lee et al. (2000) found that estimates for WW were h^2_a (0.13) and h^2_m (0.07) ; Assan and Masache (2012) observed that, the (h^2_a) 0.25 when the maternal genetic effects were included in the model, while h2a estimates were 0.21 . The maternal heritability (h^2_m) was lower (0.04) than h^2_a (0.09) when only maternal genetic effects were included in the model, and were 0.13 and 0.17 when the permanent environmental effects of the dam was fitted. The permanent environmental effects of the dam were not important. Kaygisiz *et al* (2012) found that, (h^2a), (h^2_m) and total heritability (h^2_T) were 0.15, 0.56 and 0.12 respectively for calves.

Maternal permanent were 0.021, 0.030 and 0.058 for BW, WW and DG, respectively (Table 3). Hullya Atil *et al* (2005) found that the estimates P_e^2 were 0.47 and 0.018 for BW and WW, respectively. Hwang *et al*., (2008) observed that, Pe^2 were 0.02 and 0.06 were 0.47 and 0.018 for BW and WW, respectively by DF-REML method. Gutierrez *et al* (1997) using 7 models found that, P_e^2were 0.06, 0.00 and 0.00 (model 4) and 0.0.3, 0.06 and 0.06 (model 7) for BW, WW and DG, respectively.

Significantly estimates of genetic (r_g), maternal (r_m) and phenotypic (r_P) correlations among previous traits were highly positive. (Table 4). (r_g) were 0.58, 0.56 and 0.96, while, (r_m) were 0.48, 0.40 and 0.93. but (r_P) were 0.99, 0.99 and 0.99 among previous traits. Similar to estimate reported by Koster *et al* (2000) found that genetic correlation were moderate 0.33. 0.50 and 0.93. While, highly maternal correlations were 0.72, 0.51 and 0.96. Phenotypic correlations (r_P) were 0.82, 0.86 and 0.96 between BW, WW and DG. Steinhardt and Thielscher (2000) and Cantet *et al.* (2003) found that high (r_g) BW and WW also Lengyel *et al* (2001) found that (r_P) and (r_g) for the BW and WW were 0.90 and 0.89 ; HulyaAtil *et al* (2005) found that genetic correlations ((r_g)) between (BW, WW) = 0.80 and Phenotypic correlations (r_P) between (BW, WW) = 0.89. El-Awady (2003) reported that there were positive genetic and (r_P) between BW and WW. Also, observed that genetic and (r_P) between BW and WW were 0.49 and 0.56, respectively. WW was significantly and positively correlated with all traits under study could be increased as a result of selection for the heavier WW (Shemeis *et al* 2006) (0.60), and Koots *et al*., (1994) (0.50), (r_g) and (r_P) both of BW and WW were Positive and high indicated that selection for higher BW will lead a correlated increase in WW. (r_P) indicating that the growth rate from birth to weaning may be an appropriate selection criterion for improving growth.

Table 4. Genetic correlation maternal and phenotypic correlation for traits weight at birth (BW), weight at weaning (WW) and daily gain (DG) on the Friesian cows in Karada farm .

Traits	r_g	r_m	r_P
BW X WW	0.58	0.48	0.99
BW X DG	0.56	0.40	0.99
WW X DG	0.96	0.93	0.99

Estimates of The breeding value (BV) of (calves, Sires and dams) in a herd Karada farm

Estimates of breeding values (BV) for study traits in Table 5. The range of (CBV) 51.5, 10.1 kg and 31.0 gm. for BW, WW and DG, While he was for (SBV) were 17.7kg, 101.0 kg and 12.0 gm., and (DBV) were 11.4kg, 17.8 kg and 17.7 gm. This means selection for BW for calves leading to an increase in WW for the next generation. The accuracy of (CBV) the record from 79 and %80, the calves (CBV) were higher than SBV (74 to 0.78%) and DBV (68 to 77%). The same trends were obtained by Hullya Atil *et al* (2005) found that ranges of (CBV) were higher than those for (SBV) and (DBV) for DG. (Table 5). The large weight of the cow next to the ability of the cow is very important to produce a large carcass.

The results rang of showed the important role of sire, rang WW trait was higher than those for calves and dams for WW trait. The same trends were obtained by Hulya Atil *et al* (2005).

Table 5. Estimates of breeding values (BV) for study traits in Karada herds.

BV	Traits	Maximum ± SE	Accuracy %	Minimum ±SE	Accuracy %	Range
	BW	28.47(10.5)	79	32.05(10.14)	80	51.5
Calves	WW	9.99 (9.5)	74	-0.10(10.42)	68	10.1
(CBV)	DG	16.65 (7.5)	78	-14.55(10.1)	80	31.2
	BW	10.23(11.43)	74	-7.91(10.72)	78	17.7
Sires	WW	5.01(13.2)	36	-96(8.7)	79	101.0
(SBV)	DG	6.87(11.6)	42	-5.16(8.0)	78	12.0
	BW	5.94(12.4)	68	-5.43(10.8)	77	11.4
Dams	WW	7.91(12.2)	51	-9.9(13.3)	51	17.8
(DBV)	DG	11.08(11.1)	49	-6.6(11.1)	49	17.7

Range (BW Max- BW Min)

Abera (2017) found that, the overall mean predicted breeding value for birth, weaning and one year weight were 0.11±0.06kg, 0.13± 0.09kg and1.2 ±1.4kg, respectively.

These results indicate that higher genetic improvement. The present results found that CBV positive value for WW 1676 (65.9%) Table .5. These results indicate that selection of calves on the basis of higher breeding value for BW, will increase WW production in the next generation for both sires and dams , Hossen et al. (2012) found that range of predicted breeding values (PBV) ranged from (4.4 to 8.3 kg) indicates a degree of additive genetic variation, which exists in a population. Enough variation for a trait in the population is needed so that the level for the trait can be changed along with the breeding objectives.

Environmental trend (ENV)

The figures (1- 3) are shown EGT for (BW), (WW) and DG affected by season, parity and year.

As regard to GT environmental changing by season, negative (-) ENV during the first season (autumn , summer and spring) , While the positive (+) in the winter, meaning that effects of environment was favorable versus animals during winter figure (1), the effects of environment was favorable versus animals during winter.

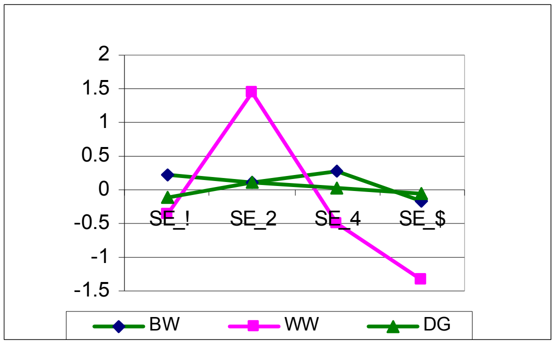

Fig 1. Traits ENV as changed versus season

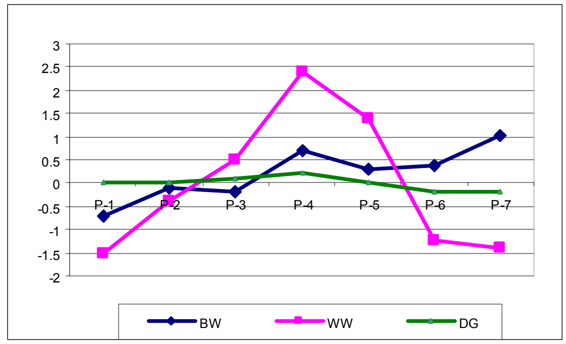

Fig 2 . Traits ENV as changed versus Parity

Interaction, data of ENV presented in figures (2).Revealed that the effects of environmental was negative for BW in the 1stand 2nd parity otherwise. This positive ENV seems to concentrate in the 1nd and 2th parity, the positive (BW) 4st, 5nd, 6th and 7th, it started to have a positive trends especially in the 1nd and 2th ones. While the effects of environmental was negative for WW in the 1st, 2nd, 6th and 7th parity otherwise and positive 3st , 4nd and 5th. Abdel-Glil and Elbanna (2001) found that birth weight of the calf increased with advance of parity and reached its peak in the fourth one.

Study traits environmental regressed against by year, showed that (BW) , (WW) and DG traits have a negative ENV during The 1th, 2th , 3th , 5th , 12th, 13th and 14th years of (BW),(WW) and DG While the remainder year gave positive (+) trends(6th to 11th) figures (3). Similar results were obtained by Faid-Allah(2010).

In general, year of calving is considered the most important source of variation in different weights at pre weaning period and this may be attributed to changes in weather, management and feeding systems.

The effect of the year of birth is related to the diversity of nutritional provided to the animal for the different type of nutrients during the seasons of the year Wilson and Willham (1986) revealed that there is not necessary to remove ENV from phenotypic trends to obtain unbiased estimates of genetic trends. Abera (2017) revealed that negative phenotypic and ENV were more pronounced for pre -weaning average daily gains in this study. This indicates that attention needs to be given to environmental factors such as nutrition, health and management.

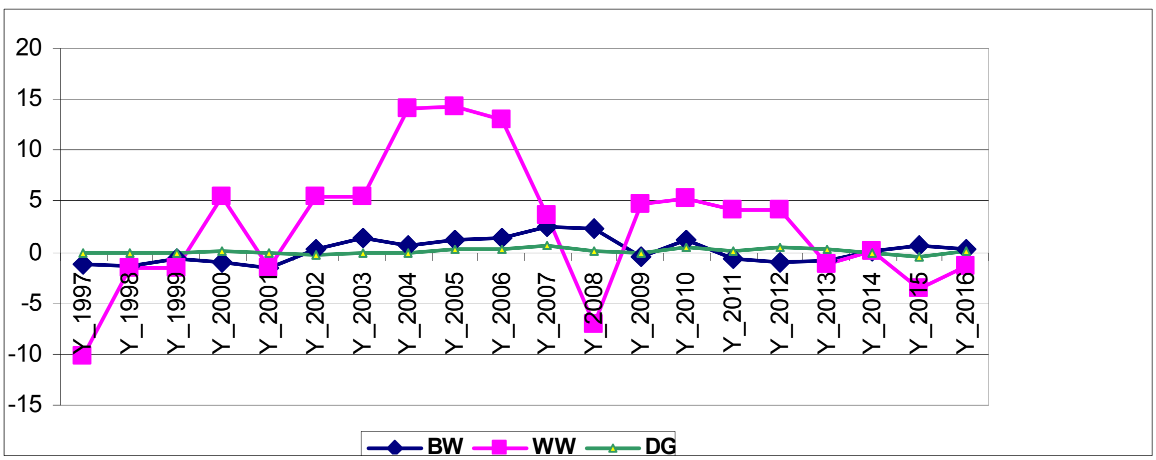

Fig. 3. Traits ENV as changed versus year

Epigenetic trend (EGT):

figures (4, 5 and 6). EGT for study traits as affected by season, parity and year. Effect of season positive trend in autumn and summer while winter and spring negative trends in figures (4). The positive (high) EGT for (GT) during winter and spring due to environmental conditions and alp alpha is available during this period.

Study traits estimated genetic trends, as a deviation from the overall-BV mean, in Fig. 1. Shows that study traits of the Friesian herd have positive genetic trend in summer and autumn. The maxi value for the evaluated study traits were generally in winter. The high genetic trend during the winter because of the availability of green fodder.

As regard to weights genetic trends, Fig. 2 shows that weight traits of the Friesian have negative genetic trend in winter and spring but positive in summer and autumn.

Figure (5). revealed that the 4th and 5th parity of BW, WW and DG gave negative(-)trends while the remainder parities gave positive(+) trends6th and 7th parity in Friesian cattle parities. The high milk traits EGT parity is apparently due to peak production (persistency) as observed in this study (Figure 3.). The same trend Usman *et al* .(2012) on GT may be due to the physiological state and environmental conditions between parties.

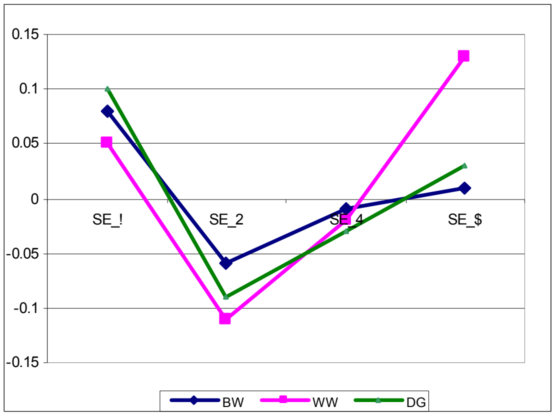

Fig. 4. EGT of study traits changed versus season

Positive genetic trend seems to concentrate in second parity with sporadic sharing from the third parity. The high genetic trend at the 6 and 7 parities is clearly due to that the animals reach their premium physiological reproductive maturity and development. However, the lowering trends following these premium parities became lowest at the later ones. Results in figure 6. The (2006 to 2008) , (2012 to 2014) years of BW and 1999 , 2003 , 2010 , 2016 years of WW traits gave negative (-) trends While, 2009 ,2010 and 2015 years of BW gave positive (+) trends also (2005 to 2008) and (2010 to 2013) years of WW traits positive trends . In general, year of calving is considered the most important source of variation in body weight and this may be attributed to changes in management and feeding systems from year to other, Holloway et al. (2002) reported that year effects were important ($P \leq 0.05$) for performance traits. Abera (2017) found that, breeding value trends have been improving and there was about 0.016 kg, 0.031 kg, 0.14 kg genetic gain in BW, WW and YW per year. The same trend Hossen et al (2012), also positive genetic and ENV are indicators of favorable selection methods and good management (Plasse *et al.* 2002).

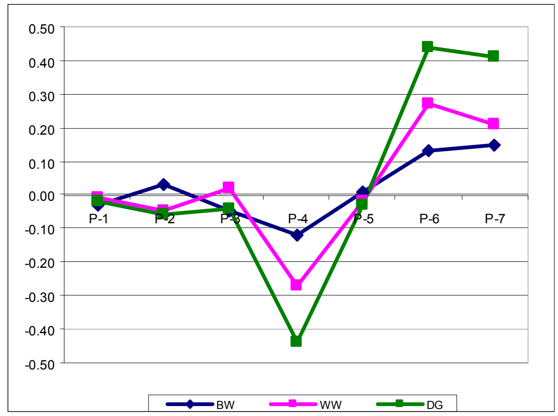

Fig. 5. EGT of study traits changed versus parity

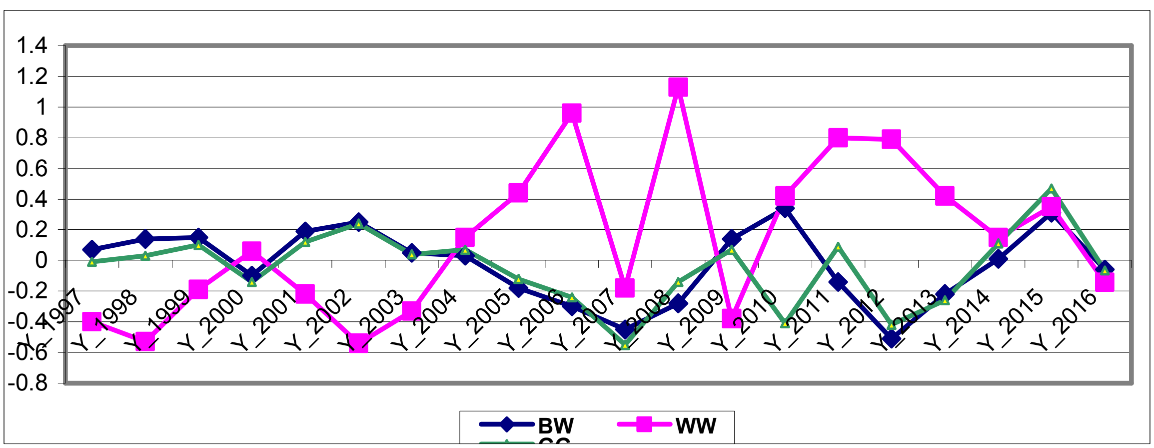

Fig. 6 . EGT of study traits changed versus year

CONCLUSION

In Egypt, seems to be a productive local Friesian breed. It was ignored for many times without selection. It needs to be genetically ameliorated to produce more meat and cover the consumers demand. An attention of modern husbandry could be paid to realize this objective. Fortunately, the obtained estimates of heritability and most of the genetic correlation coefficients were high; they will be used in a breeding plan that will be effective to improve rapidly this breed. Daily gain effect is very important for pos-weaning traits; we can conclude that the daily gain effect should be included in the genetic evaluation of breeding programs.

In the present study calving of season, calving of year and parity were important factors affecting birth weight. In the next studies, the effects of environmental factors should be eliminated for the effective selection program based on birth weight.

High and positive genetic and phenotypic correlation between BW and WW. Phenotypic correlation indicating that the growth rate from birth to weaning may be an appropriate selection criterion for improving growth. The selection based on the CBV of calves increases the WW of sires and dams in the next generation.

Figures of Epigenetic trend (EGT) showed that the effect of year of calving is considered the most important source of variation in body weight and this may be attributed to changes in management and feeding systems from year to other. Also study traits of the Friesian herd have positive genetic trend in summer and autumn. The maxi value for the evaluated study traits were generally in winter. The high genetic trend during the winter may be due to availability green fodders.

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تقدير المعالم الوراثية والمظهرية لصفات النمو في ابقار الفريزيان المرباه في مصر

صفاء سند و محمود غريب
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تم دراسة صفات النمو لعدد ١٦٩١ سجل إنتاجي ، عدد الاباء ٧٤ أب وعدد الامهات ٧٨٩ أثناء الفترة من ١٩٩٧ إلى٢٠١٦ في قطيع إنتاج اللبن محطة القرضا بكفر الشيخ ، مصر واستخدم في التحليل برنامج نموذج الحيوان متعدد الصفات (DFREML) لحساب المكافئات الوراثية (المضيف ، الامي) والبيئي الدائم والتباينات المتبقية مع إمكانية الاستفادة من Epigenetics في برامج الانتخاب لصفات الوزن عند الولادة كجم ، الوزن عند الفطام كجم ، ومعدل الزيادة اليومية بالجرام . كان المتوسط للوزن عند الولادة، الوزن عند الفطام، ومعدل الزيادة اليومية ٢٨.٦كجم ، ٩٢.٦ كجم ، ٠.٦٠جم على التوالي، أوضحت النتائج أن قيم المكافئ الوراثي تراوحت بين المنخفضة و المتوسطة وكانت قيم h^2_m, h^2_a للصفات ٠.٣٢, ٠.٢٢ ,٠.٣٤ على التوالي بينما كانت قيم h^2_m منخفضة وتراوحت بين ٠.١٢ ، ٠.٠٨ ، ٠.١٨ علي التوالي، بينما كانت قيم التأثير البيئي الدائم منخفضة حيث تراوحت هذه القيم للصفات المدروسة علي الترتيب ٠.٠٢١، ٠.٣٠، ٠.٥٨ وعليه فان تأثير اداء قطيع الدراسة يتأثر وراثيا بالعوامل البيئية حيث الرعاية الجيدة من خلال الام يؤدي لتحسين صفات الدراسة. كان معامل الارتباط المظهري بين جميع صفات الدراسة موجبة وعالية جدا وصلت الى ٠.٩٩ بينما كانت الارتباطات الوراثية المباشرة بين صفات الدراسة موجبة وتراوحت بين ٠.٥٦ الي ٠.٩٩مما يوضح أن معدل النمو من الميلاد حتى الفطام قد يكون معيار انتخابي مناسب لتحسين مظاهر النمو. وكذلك كانت الارتباطات الوراثية الامية بين صفات الدراسة موجبة وتراوحت بين ٠.٤٠ الي ٠.٩٣كانت القيم التربوية للصفات المدروسة للعجول ٥١.٥ كجم ، ١٠.١كجم و٣١.٢جم علي التوالي وهي أعلي من نظائرها للأب ١٧.٧، ١٠١.٠ و ١٢.٠ وللأم ١١.٤، ١٧.٨و١٧.٧علي التوالي لذلك يمكن الانتخاب للعجلات لصفات النمو علي أساس القيم التربوية للعجول بالنسبة لصفةعمر الميلاد و معدل الزيادة اليومية حيث يكون أكثر كفاءة لتحقيق تحسينا وراثيا ملموسا للانتخاب لصفات النمو.عموما كان اتجاه التعبير الجيني (EGT) موجبا في فصل الخريف والصيف ٬ بينما كان سالبا في فصل الشتاء والربيع للصفات المدروسة وبالنسبة لتأثر الظروف البيئية علي قطيع الدراسة متمثلة في تأثير السنة وموسم الولادة فقد أظهر تأثيرا يشير الى الاحتياج الي مزيد من الرعاية ليتمكن القطيع من التعبير عن قدرتها الوراثية وذلك عن طريق الاهتمام بتحسين الظروف البيئية المحيطة بقطيع الدراسة . ملخص لنتائج الدراسة فيما يلي :تحسين الأداء للحيوان تحت الدراسة عن طريق تقدير العوامل البيئية والوراثية ومعرفة مدي تأثيرهم على أداء النمو الذي سيسمحان لتحديد معايير قياسية لتقييم الأداء لهذا القطيع.النتائج تظهران الصفات تحت الدراسة عالية الى متوسطة لقيم المكافئ الوراثي كما أن الارتباطات الوراثية بين صفات الدراسة موجبة وعالية كما أن التأثيرات الوراثية المباشرة والبيئية الدائمة تكون أكثر فاعلية في عملية الانتخاب .كما تظهر النتائج أن جميع صفات النمو لديها أمكانية واضحة لتحسين العائد من خلال الانتقاء الوراثي المباشر كما إنه بمزيد من الرعاية الجيدة والانتخاب علي أساس القيم التربوية للعجول مما يؤدي لزيادة كفاءة الانتخاب ستساعد هذه الدراسة المربين على اختيار أفضل الحيوانات التي سيتم استخدامها للإنتاج.