Improving Reproductivity and Productivity Traits Using Selection Indices in Friesian Cows

Abosaq,F.M.[1]; Zahran,S.M.[1]; Khattab, A.S.[2]; Zeweil, H.S.[1] and Sallam,S.M.[3]
[1] Dept. of Animal and Fish Production, Fac. Agric. (Saba Basha), Alex. Univ.
[2] Dept. of Animal Production, Fac. Agric., Tanta Univ.
[3] Dept. of Animal and Fish Production, Fac. Agric. (Elshatbe), Alex. Univ.

Corresponding author: Abosaq F., email: abosaqfathi@gmail.com

ABSTRACT: A total number of 2854 lactation records of 699 Friesian cows sired by 80 bulls, during the period from 1985 to 2014 were used in this study to investigate of month and year of calving and parity as fixed factor and sire and dam within sire as random factor; in addition estimate phenotypic and genetic parameters for 305-day milk yield (305-dMY), Lactation period (LP), peak milk yield (PY) and days open (DO); nineteen selection indices (general and reduced) using one phenotypic standard deviation as REV_1 and lamont method as REV_2. Least square analysis showed significant ($P<0.05$) effect of genetic and non-genetic factors on all studied traits except the effect of month of calving on 305-dMY. Heritability estimate for 305-dMY, LP, PY and DO were 0.33, 0.07, 0.26 and 0.04, respectively. Phenotypic correlation between each two traits ranged from 0.03 to 1.0; and genetic correlation between each two traits ranged from 0.41 to 0.96; general indices I_1 and I_{11} incorporating 305-dMY, LP, PY and DO was the best (R_{IH} = 0.57) and it is recommended if the selection was exercised; in addition there are high similarity of genetic gains under the two different groups of economic values REV_1 and REV_2.
Keywords: cows-reproduction, milk-selection, index, economic, genetic, environment

INTRODUCTION

Egyptian dairy sector mainly consist of exotic and local dairy cattle and buffaloes contributing major share in dairy produce, Holstein cows are the most exotic breed; the dairy sector in Egypt wents to increase dairy production through genetic improvement; Although milk production is clearly a major component of profitability, the emphasis it has received is, also due to the ease of measurement compared to some other components of profitability. Hazel and lush (1942) showed that the selection index was the most efficient method for selection in farm animals. However, continued selection for higher milk production has been questioned on a number of accounts as it has been widely associated with deleterious effects on health, fertility and welfare of cows, as antagonist relationship (El-Arian, 2005 and Pryce *et al.*, 2002). Berry *et al.* (2003) have noted, however, that there is a possibility to select increasing milk production without negatively impacting fertility. Within the selection index are combined the production levels of two or more characteristics, obtaining a score based on which is made the selection. Such an obtained score is in maximal correlation with the genetic contribution of certain individual. (Ivanović *et al.* , 2014), since some authors have attempted to use milk yield and some reproductive traits in a combined index (El-Arian, 2005 and Atil, 2006). The performance traits like milk yield and reproductive traits are considerably affected by environmental factors, which, in addition to genetic differences, are responsible for the marked variation between month and year of calving, parity and animals within the same breed (Hassan and Khan, 2013).

Estimation of genetic and phenotypic parameters for productive and reproductive traits is an important tool for the definition and evaluation of selection programs. The genetic correlations between the traits play important role in deciding single vs. multiple trait selection strategy. Parameters can be estimated using several methods, such as Least Square Methods (LSM), Restricted Maximum Likelihood (REML), and Best Linear Unbiased Predictions (BLUP). In order to improve or at least stop the deterioration trend in fertility, more emphasis on fertility traits in selection is necessary.

The aim of this study was to estimate genetic parameters for fertility and milk production traits 305 days milk yield (305-dMY), lactation period (LP), peak yield (PY) and days open (DO) in Holstein cows in Egypt. Estimation of genetic parameters is important for estimating breeding values and for designing selection indexes by using two methods of deriving relative economic values. The present study provides information about these two parameter sets important for production and fertility traits that are greatly related to the profitability of the dairy industry.

MATERIALS AND METHODS

A total number of 2854 lactation records of 699 cows sired by 80 bulls, during the period from 1985 to 2014 in dairy project Friesian herd in farm key conducted to Alexandria University were used in the present study, the records without pedigree, breeding dates and cows affected by diseases and aborted cows were excluded.

Statistical analysis

Factors affecting traits studied were analyzed by general linear model (GLM) using SAS computer program (SAS, 2002) as follow model:

$$Y_{ijklm} = \mu + S_i + D_j + M_k + Y_l + P_m + e_{ijklm}$$

Where : Y_{ijklm} = the individual observation; μ = the overall means; S_i = the random effect of the sire i^{th} ; D_j = the random effect of the dam j^{th} within sire i^{th} ;M_k = the fixed effect of the month of calving (k= 1-12); Y_l = the fixed effect of the year of calving (l=1-10); P_m = the fixed effect of parity (p=1-8) and e_{ijklm} = the residual effect with $e_{ijklm} \sim N(0, \sigma^2_e)$

Genetic and phenotypic parameters

Heritability, genetic and phenotypic correlation and (co)variance genetic and phenotypic of studied traits were estimated with derivative-free restricted maximum likelihood et (REML) procedures using the MTDFREML program of Boldman *et* al. (1995: p.53). The assumed model was: $y = Xb + Zu + e$ where, y: a vector of observations, b is a vector of fixed effects with an incidence matrix X, u is a vector of random animal effects with incidence matrix Z, and e is a vector of random residual effects (temporary environment) with mean equals zero and variance σ^2_e

Derivation of relative economic value

Prior to computing the complete index, the economic values (v) were calculated by two methods, the economic value of milk yield were set to unity and the relative economic values of other traits were calculated relatively as shown in Table (1).

1. One phenotypic standard deviation (REV_1): the economic value calculated depending on the phenotypic standard deviation where, $REV_1 = 1/\sigma_p$ where σ_p is the phenotypic standard deviation of trait According to (Sharma and Basu, 1986 and Falconer and Mackay,1996)
2. Lamont method (REV_2): according to Lamont (1991) the method depending on heritability estimates of the all traits, where, $REV_2 = T / h_i^2$ where $T = h^2_{305y} + h^2_{lp} + h^2_{peak} + h^2_{do}$

Table (1). The economic values of the traits studied relative to 305 dMY according to two methods

Trait	1/ σp (REV_1)	Relative economic value	Lamont method (REV_2)	Relative economic value
305-dMY	1/ 1454.35	1	2.48	1
LP	1/ 112.75	12.9	11.71	4.72
Peak	1/ 6.14	236.9	3.15	1.27
DO	1/ 98.43	-14.77	20.5	- 8.27

The index value was calculated as

$$I = \sum_{i=1}^{n} (bi\, pi)$$

I is selection index, b_i is a selection index weighing factor, p_i is a phenotypic measure and n is number of traits. Hazel (1943) proved that maximum r_{HI} is achieved when $Pb = Gv$, then The vector of optimal index weights (b) was calculated for each of the objectives as $b=P^{-1}Ga$ where: P^{-1} is the inverse of the phenotypic (co)variance matrix of the traits in the selection index, G is the genetic covariance matrix between traits in the selection goal and the selection index, and a is the vector containing the economic values for the goal traits. Furthermore, the other different properties of the selection index were calculated as following: Standard deviation of the index $(\sigma_I) = \sqrt{b'Pb}$, Standard deviation of the aggregate genotype $(\sigma_H) = \sqrt{a'Ga}$, Correlation between the index and the aggregate genotype (accuracy) $R_{IH} = \sigma_I / \sigma_H$.

RESULTS AND DISCUSSION

The overall means (Unadjusted means) and their standard error, standard deviations (SD) and coefficient of variation (C.V) % of 305 days milk yield (305-dMY), lactation period (LP), peak milk yield (PY) and days open (DO) were showed in Table (2).The present estimate of actual mean of 305-day milk yield is across all lactations of the study (4227 kg) is higher than those reported by Khattab and Atil (1999), Usman *et al.* (2012) and El-Awady (2013). The present overall mean was lower than that estimated by Shalaby *et al*. (2013), Rushdi *et al*. (2014) and Faid-Allah (2015). Generally the present overall mean within the range of means reported in the other countries for the same trait as mentioned by Ashmawy and Khalil (1990) and Atil (2006). The overall unadjusted mean of lactation period (LP) 327 days, it was similar to that estimated by Shalaby *et al*. (2013) 327 days and it was lower than that reported by Singh and Gurnani (2004) 346 days in Friesian crosses, and Khattab and Atil (1999) 367 days using Friesian cows. The overall unadjusted mean of peak yield 22.5 kg, this value was higher than that estimated by El-Awady (2013) 15 kg in using Friesian cows and Ahmed *et al.* (2004) 6 kg in Friesian crosses. The successful service occurring with 145 days post-partum, it is days open (DO), this value nearly similar to that estimated by Hammoud *et al* (2014) 139 days in Friesian cows and M'hamdi *et al*. (2010) 151 days in Holstein cows in Tunisia.

The least squares analysis of variance for data of all available lactations (Table 3) gave evidence that sire and dam within sire of the cow was significant source of variation ($p < 0.0001$) in the studied traits, which indicating that sire selection may be used as useful tool for the genetic improvement of these milk production traits, This agrees well with findings of Nawaz *et al* (2013) and Al-Samaria *et al*. (2015) . In particular, large magnitude of the sire and cow estimates might indicate a sizable potential for sire and cow in selection programs and or/ in change of the herd management to improve milk yield traits. Least square analysis of variance in (Table 3) indicates that month of calving, year of calving and parity are considered the major factors affecting 305-dMY, LP, Peak yield and DO except month of calving had no significant ($P> 0.05$) effect on 305-dMY . The same trend obtained by Lakshmi *et al*. (2009); Usman *et al* (2012) and Faid-Allah (2015).

This lead to conclude that adjusting of lactation records for these factors are very necessary for estimating genetic parameters and sire evaluation. In addition, higher F- Values for the effect of year of calving on productive and reproductive traits could be due to changes in herd size, age of animals and managerial practices which vary from year to year and also may be due to attribute to the different climatic condition

Table (2). The overall means, standard deviation and coefficient of variation of studied traits

Traits	Mean	SD	C.V%
305-dMY	4227.436	1454.35	34.40
LP	327.30	112.7	34.5
Peak	22.79	6.14	26.96
DO	144.49	98.43	68.12

Table (3). Least squares analysis of variance for genetic and non-genetic factors affecting on 305Y, LP, Peak and DO in Friesian cows

S.O.V	**df**	**F-Values**			
		305-dMY	**LP**	**Peak**	**DO**
Sire	79	6.26 **	3.15 **	23.29 **	2.01 **
Dam/sire	619	2.31 **	1.42 **	7.10 **	1.5 **
Month of calving	11	1.12 ns	1.98 *	2.19 **	2.52 **
Year of calving	9	39.45 **	25.8 **	12.18 **	9.11 **
Parity	7	16.34 **	5.92 **	3.94 **	2.88 **
Residual	1523				

* ($P<0.05$) ** ($P<0.01$) ns ($P>0.05$)

Estimate of heritability (h^2) for 305-dMY, LP, PY and DO were 0.33, 0.07, 0.26 and 0.04, respectively (Table 4). This estimates shows similarity to that reported by Al-Samaria *et al*. (2015) for 305-dMY and LP which where 0.35 and 0.06, respectively, while Lakashmi *et al* (2009) and El-Awady (2013) found higher values for PY 0.16 and 0.24, respectively, the heritability estimates in the present study indicated low genetic to environmental variance ratio for LP and DO, while the moderate value of heritability estimate for 305-dMY and PY would indicate moderate contribution of additive. In respect of estimates of genetic and phenotypic correlation among the studied are present in (Table 4) all correlations were positive ranging from 0.41 to 0.96 for (r_g) and from 0.03 to 1.0 for (r_p).

Table (4). phenotypic correlation (above), genetic correlation (below), variance components (V_P, V_A and V_E) and heritability (h^2) for 305-dMY, LP, PY and DO traits on the Friesian cows

traits	305dMY	LP	Peak	DO	V_P	V_A	V_E	h^2
305 dMY		0.50	0.70	0.18	1918831	630727	1288104	0.33
L.P	0.83		0.12	1.00	11600	811	10790	0.07
Peak	0.96	0.56		0.03	27.51	7.07	20.4	0.26
DO	0.50	0.75	0.41		8770	390	8380	0.04

Table (5). selection criteria, Weighting factors (b-values), expected genetic gains (∆G), standard deviation of the index (σi),relative efficiencies of selection (R_{IH}) and Economic weight (1/ σ_p method) in general (I_1 and I_{11}) and reduces indices used to improve 305DMY, LP, PY and DO in Holstein cows .

Selection index	Rank	305 dMY		LP		PY		DO		σ_I	R_{IH}	RE% to I_G
		b	∆G	b	∆G	b	∆G	b	∆G			
REV_1 (1/ σp method)												
I_1		0.3552	454.7	4.3432	12.4	75.7649	1.436	-4.6506	4.8	923.60	0.57	100
I_2	1	0.6562	464.5	-0.9763	12.9	41.8614	1.512	-	5.4	1030.42	0.59	103.5
I_3	4	0.3209	432.5	2.9497	13.1	-	1.475	-3.43866	4.5	534.17	0.55	96.5
I_4	3	0.3996	460.9	-	13.6	55.4096	1.511	-0.2756	5.4	780.75	0.57	100
I_5	8	-	389.5	-1.0545	0.13	7.6861	1.621	1.2636	9.5	22.49	0.35	61.4
I_6	3	0.47626	458.9	-0.5515	13.5	-	1.475	-	5.4	632.03	0.57	100
I_7	2	0.4518	462.5	-	13.6	57.1692	1.510	-	5.4	861.65	0.58	101.8
I_8	5	0.27444	451.7	-	13.6	-	1.475	-0.4893	5.2	374.75	0.54	94.7
I_9	6	-	389.5	0.10849	9.8	6.57309	1.357	-	3.9	37.66	0.51	89.5
I_{10}	7	-	389.5	-	8.1	0.2137	1.340	-0.00045	3.9	1.12	0.46	80.7
REV_2 (lamont method)												
I_{11}	2	0.2236	454.8	1.5946	12.7	29.5996	1.439	-1.7521	4.9	475.30	0.57	100
I_{12}	1	0.3447	464.2	-0.3651	13.1	17.4012	1.500	-	5.4	527.95	0.58	101.8
I_{13}	4	0.2628	430.3	3.1183	13.1	-	1.475	-3.58198	4.3	456.50	0.55	96.5
I_{14}	1	0.24	462.7	-	13.6	22.1232	1.501	-0.1457	5.5	419.62	0.58	101.8
I_{15}	1	0.39253	459.4	-0.6243	13.4	-	1.475	-	5.4	522.58	0.58	101.8
I_{16}	1	0.2693	463.5	-	13.6	23.0796	1.500	-	5.4	465.35	0.58	101.8
I_{17}	3	0.2983	454.4	-	13.6	-	1.475	-0.26115	5.4	409.57	0.56	98.2
I_{18}	5	-	389.5	0.06266	10.5	1.46939	1.208	-	3.9	10.81	0.37	64.9
I_{19}	6	-	389.5	-	8.1	-4.6355	-1.07	-0.27805	-5.7	36.21	0.28	49.1

Table (4). Shows the ranking of selection indices on the basis of their accuracy (r_{IH}), weighting coefficients (b_s), Relative efficiency (RE) and expected genetic change (ΔG) per generation of various traits studied.

Comparison between all 19 selection indices when using one phenotypic standard deviation as REV_1 and lamont method as REV_2 showed that the selection index I_1 and I_{11} which incorporated (305-dMY), Lactation period (LP), peak milk yield (PY) and days open (DO), the equation of the general indices I_1 and I_{11} were:

I_1 = 0.3552 (305-dMY) + 4.3432 (LP) + 75.7649 (PY) - 4.6506 (DO).

I_{11} = 0.2236 (305-dMY) + 1.5946 (LP) + 29.5996 (PY) – 1.7521 (DO).

The standard deviations of those indices were (923.6) and (475.3) respectively and their correlations with the aggregate genotype were (0.57) The expected genetic changes per generation in each variate assuming a selection intensity "one" which would be gained due to applying this index were +454.7 kg, +12.4 d, +1.436 kg and +4.8 d +454.8 kg, +12.7 d, +1.439 kg and +4.9 d for 305-dMY, LP, PY and DO, respectively. When using the economic value by REV1 REV_2,.

General indices I_1 and I_{11} which include all four traits ranked the 3rd and 5th (RE=100%), there it recommended to apply selection based on these indices, negligible increase in RE values occurred when DO dropped from general indices. The highest increase in RE values to 103.5 , 101.8 % when LP and/or DO dropped from general indices which caused their rank 1th and 2ed, respectively in both REV_1 and REV_2. The dairy men are interested to minimize the deterioration of fertility through declining the DO period because this will increase life time productivity and increase directly the income from milk and calves sales.

Dropping 305-dMY in I_5 , I_9 , I_{10} , I_{18} and I_{19} resulted decline in RE values down to 61.4 , 89.5 , 80.7 , 64.9 and 49.1 %, respectively which caused their rank to fell down, it illustrates that important of including 305-dMY in any selection index to improve the total merit. The same trend obtained by El-Awady (2009) and Set El-Habbaeib (2015) the RE value decreased when dropped MY from general selection indices. (El-Arian 2005) noticed decreasing in RE value was occurred when AFC as trait was dropped from any indices and their ranking were declined.

The lowest index by REV_2 method was I_{19} which include PY and DO. The inclusion of 305-dMY in this index resulted in considerable improvement in RE of this index from 49.1 to 101.8.

Since the maximum return can be achieved by using the general index I_1 or I_{11}, It is recommended for improving milk production and improving or at least minimizes the deterioration trend in fertility under economic values derived by the both mentioned methods.

The rank correlation among general and reduced indices when using two methods of relative economic value REV1 and REV2 was 0.99 (P<0.001) which indicated quite high similarity of genetic gains under the two different groups of economic values. It might be reliable to REV1 and REV2 due to it is simplicity and high applicability. In addition relative efficiency, accuracy of index and correlated response indicated the same results.

CONCLUSION

Selection indices I_1 and I_{11} which incorporated 305 days milk yield (305-dMY), lactation period (LP), peak yield (PY) and days open (DO) was recommended when selection was exercised. Inclusion of (305-dMY) in any selection index was recommended.

ACKNOWLEDGMENT

The authors thank Mr. Khaled Abdel-Aziz Amin and his colleagues of dairy project in farm key conducted to Alexandria University for providing them with data that used in this study.

REFERECES

Ahmed, A.R., S. S. Islam, N. Khanam and A. Ashraf. (2004). Genetic and Phenotypic Parameters of Milk Production Traits of Crossbred Cattle in a Selected Farm of Bangladesh. J. Bio. Sci., 4 (4): 452-455.

Al-Samaria, F.R., Y.K. Abdurrahman, F.A. Mohammed, F.H. Al-Zaidi, and N.N. Al-Anbari. (2015). Comparison of several methods of sires evaluation for total milk yield in a herd of Holstein cows in Yemen. Open Vete. J. ,5 (1): 11-17.

Ashmawy, A.A. and M.H. Khalil. (1990). Single and multi-trait selection for lactation in Holstein Friesian. Egypt. J. Anim. Prod., 27:171-184.

Atil, H. 2006. Comparison of different selection indices for genetic improvement for milk traits in Holstein Friesian cattle in Turkey by using one standard deviation as relative economic weight. Pakistan j. Biolo. Sci., 9(2):285-288.

Berry, D.P., F. Buckley, P. Dillon, R.D. Evans, M. Rath and R.F. Veerkamp. (2003). Genetic Relationships among Body Condition Score, Body Weight, Milk Yield, and Fertility in Dairy Cows. J. Dairy Sci., 86(6):2193–2204.

Boldman, K. G, L. A. Kriese; L. D. Van Vleck and S. D. Kachman (1995). A manual for use of MTDFREML. A set of programs to obtain estimates of variances and covariances (DRAFT). ARS, USDA, Washington, D. C.

El-Arian M.N. (2005). Selection indices for Friesian cows using two methods of calculating relative economic values for some important productive and reproductive traits. J. Agric. Sci. Mansoura Univ., 30(12): 7285-7296.

El-Awady, H.G. (2009). Calculation of the economic values for some udder health traits to estimate the profitability of the selection indices for dairy cows in Egypt. J. Agric. Res. Kafr El-Sheikh Univ., 35(2): 384- 401.

El-Awady, H.G. (2013). Genetic aspects of lactation curve traits and persistency indices in Friesian cows. Arch. Zootech., (16)1:15-29.

Faid-allah, E.(2015). Genetic and Non-Genetic Analysis for Milk Production and Reproductive Traits in Holstein Cattle in Egypt. Indon. J. Anim. Vete. Sci. 20(1):10-17.

Falconer, D. and T. Mackay. (1996). Introduction To Quantitative Genetics. 4th ed., Long man, London and NY.

Hammoud, M.H., H.G. El-Awady and A.A. Halawa. (2014). Changes in Genetic and Phenotypic Parameters of Some Production and Reproduction Traits by Level of Milk Production of Friesian Cows in Egypt. Alex. J. Agric. Res., 59(3):169-177.

Hassan, F. and M.S. Khan. (2013). Performance of crossbred dairy cattle at military dairy farms in Pakistan. J. Anim. Plant Sci., 23(3): 705-714.

Hazel, L.N. (1943). The genetic basis for constructing selection indexes .Genetics 28: 476-490.

Hazel, L., and J. Lush. (1942). The efficiency of three methods of selection. Jou. Heredity, 33: 393 – 399.

Ivanović, S, D. Stanojević, L. Nastić and M. Jeločnik (2014). Determination of economic selection index coefficient for dairy cows. Econ. Agri. (61) 4: 861-875.

Khattab, A. S., and H. Atil. (1999). Genetic study of fertility traits and productive in a local born Friesian cattle in Egypt. Pakistan J. Bio. Sci., 2(4):1178-1183.

Lakshmi B. S., B. R. Gupta, K. Sudhakar, M. G. Prakash, and S. Sharma. (2009). Genetic analysis of production performance of Holstein Friesian X Sahiwal cows. Tamilnadu J. Vete. Anim. Sci., 5 (4): 143-148.

Lamont, S.J. (1991). Selection for immune response in chickens. Presented at the 40th Annual National Breeder Round Table, May 2-3. St. Louis, Missouri.

M'hamdi, N., R. Aloulou, S. K. Brar, M. Bouallegue, and M. Ben Hamouda (2010). Phenotypic and genetic parameters of reproductive traits in Tunisian Holstein cows. Biotech. A. Husb., 26:297-307.

Nawaz, A., A.H. Nizamani, I.B. Marghazani and A. Fatih (2013). Influence of genetic and environmental factors on lactation performance of Holstein Friesian cattle in Balochistan. J. Anim. Plant Sci., 23, 17-19.

Pryce J. E., M. P. Coffey, S. H. Brotherstone, and J. A. Woolliams. (2002). Genetic Relationships Between Calving Interval and Body Condition Score Conditional on Milk Yield. J. of Dairy Sci., 85 (60):1590–1595.

Rushdi, H.E., M.A.M. Ibrahim, N.Q. Shaddad and A.A. Nigem. (2014). Estimation of genetic parameters for milk production traits in A herd of Holstein Friesian cattle in Egypt. J. Anim. Poul.Prod., 5(5):267-278.

SAS, (2002). User's guide: Statistics, version 9. 4th Ed. SAS Ins., Inc., Cary., NC, USA.

Set-Elhabaeib S. A. (2015). Selection for mastitis resistance and somatic cell counts to improving milk production in Egyptian buffaloes. J. Anim. Poult. Prord. Mansoura Univ., 6(2): 73-84.

Shalaby, N.A., A.S.A. El-Barbary, E.Z.M. Oudah, and M. Helmy. (2013). Genetic analysis of some productive and reproductive traits of first lactation of Friesian cattle raised in Egypt. J. Anim. Poult. Prod., Mansoura Univ., 4 (2): 97-106.

Sharma, A. and S. B. Basu (1986). Incorporation of profit variables for the maximization of genetic gain. Indian J. Dairy Sci., 39:35.

Singh, M. K., and M. Gurnani (2004). Performance evaluation of Karan Fries and Karan Swiss cattle under closed breeding system. Asian-Aust. J. Anim. Sci., 17(1):1-6.

Usman T, G. Guo, S. M. Suhail, S. Ahmed, L. Qiaoxiang, M. S. Qureshi and Y. Wang. (2012). Performance traits study of Holstein Friesian cattle under subtropical conditions. J Anim Plant Sci., 22:92-95.

الملخــــص العربـــي

تحسين الصفات التناسلية والإنتاجية باستخدام أدلة الإنتخاب في ماشية الفريزيان

[١]فتحي مصطفى أبوساق و[١]سليمان محمد زهران و[٢]عادل صلاح خطاب و[١]حسن صابر زويل و[٣]صبحي محمد سلام

[١] قسم الإنتاج الحيواني والسمكي – كلية الزراعة (سابا باشا) – جامعة الإسكندرية

[٢] قسم الإنتاج الحيواني – كلية الزراعة – جامعة طنطا

[٣] قسم الإنتاج الحيواني والسمكي – كلية الزراعة (الشاطبي) – جامعة الإسكندرية

تم استخدام عدد 2854 سجل إنتاجي من 699 بقرة تم تلقيحها بـ 80 طلوقة أثناء الفترة من 1985 إلى 2014 في قطيع مشروع إنتاج اللبن في أبيس التابع لجامعة الإسكندرية تهدف هذه الدراسة إلى :

١- دراسة تأثير العوامل الوراثية وغير الوراثية على الصفات المدروسة .

٢- تقدير المعايير المظهرية والوراثية لصفات التناسل وصفات إنتاج اللبن .

٣- عمل مجموعة من الأدلة الإنتخابية تتضمن توليفات من الصفات التناسلية والإنتاجية.

تم حساب المعايير الإحصائية وتحليل التباين والإرتباط والإنحدار باستخدام برنامج SAS (SAS 2004) بينما تقدير المعايير الوراثية والمظهرية تم بواسطة برنامج نموذج الحيوان وكان متوسط قيم صفات محصول اللبن في 305 يوم ، طول موسم الحليب ، أقصى كمية لبن يوميا و الفترة من الولادة وحتى أول تلقيح ناجح كانت 4227.436 كجم ، 327.30 يوم، 22.79 كجم، 149.49 يوم على التوالي . كما بينت نتائج تحليل التباين أن كل العوامل المدروسة الثابتة والمتغيرة لها تأثير معنوي على كل الصفات باستثناء صفة محصول اللبن في 305 يوم لم تتأثر معنويا بشهر الولادة. قيم المكافيء الوراثي للصفات كانت 0,33 , 0,07 , 0,26 ، o,o4 على التوالي وتراوح معامل الإرتباط المظهري بين الصفات من 0,03 إلى 1.0 والإرتباط الوراثي من + 0,41 إلى 0.96

استخدمت الصفات المدروسة لعمل 19 دليل إنتخابي حيث استخدمت طريقة وحدة واحدة من الانحراف المعياري المظهري كقيمة إقتصادية لعدد 10 أدلة إنتخابية (دليل عام – مختزل) وباستخدام طريقة لامونت لتقدير القيمة الاقتصادية تم عمل 9 أدلة إنتخابية (دليل عام – مختزل) الدليل العام كان الأكفأ باستخدام طريقتي إشتقاق القيمة الإقتصادية

$$I_1 = 0.3552\ (305\text{-dMY}) + 4.3432\ (LP) + 75.7649\ (PY) - 4.6506\ (DO).$$

$$I_{11} = 0.2236\ (305\text{-dMY}) + 1.5946\ (LP) + 29.5996\ (PY) - 1.7521\ (DO).$$

تطبيق الدليل العام I_1 أدى إلى تغير وراثي متوقع لصفات الصفات محصول اللبن في 305 يوم ، طول موسم الحليب ، محصول اللبن عند القمة و الفترة من الولادة وحتى أول تلقيح ناجح قدره + 454.7 كجم و 12.4 يوم و 1.346 كجم و 4.8 يوم على التوالي، وكان معامل الإرتباط بين الدليل والقيمة الوراثية الكلية (0.57). تطبيق الدليل العام I_{11} أدى إلى تغير وراثي متوقع لصفات محصول اللبن – 305 يوم ، طول موسم الحليب ، محصول اللبن عند القمة و الفترة من الولادة وحتى أول تلقيح ناجح قدره + 454.8 كجم و 12.7 يوم و 1.439 كجم و 4.9 يوم على التوالي، وكان معامل الإرتباط بين الدليل والقيمة الوراثية الكلية (0.57).

الكفاءة النسبية للأدلة المختزلة بالنسبة إلى الدليل العام عند استخدام وحدة واحدة من الانحراف المعياري المظهري تراوحت من 80.7% إلى 103.5 % ومعامل الإرتباط بين الدليل والقيمة الوراثية الكلية تراوح من 0.46 إلى 0.59 ؛ وباستخدام طريقة لامونت تراوحت الكفاءة النسبية من 49.1 % إلى 101.8 % ومعامل الإرتباط بين الدليل والقيمة الوراثية الكلية تراوح من 0.28 إلى 0.58.

نستخلص من هذه الدراسة أن الأدلة العامة I_1 و I_{11} والتي تشتمل عل صفات محصول اللبن في 305 يوم ، طول موسم الحليب ، أقصى كمية لبن يوميا و الفترة من الولادة وحتى أول تلقيح ناجح هي الأفضل وينصح باستخدامها في حالة تطبيق دليل الإنتخاب لغرض التحسين الوراثي، وأن إسقاط صفة محصول اللبن في 305 يوم من الدليل أدت إلى إنخفاض شديد في كفاءة الدليل.