Egyptian J. Anim. Prod. (2003)40(1):15-26.

GENETIC ANALYSIS OF SOME PERFORMANCE TRAITS USING AN ANIMAL MODEL IN A HERD OF EGYPTIAN BUFFALOES

A. S. Khattab[1], H. G. El-Awady[2], M. N. El-Arian[3] and Kawthar , A. Mourad[4]

1- Department of Animal Production, Faculty of Agriculture, Tanta, Tanta University, Egypt, 2- Department of Animal Production, Faculty of Agriculture, Kafr El-Sheikh, Tanta University, Egypt, 3- Department of Animal Production, Faculty of Agriculture, Mansoura University, Egypt and 4- Animal Production Research, Institute, Ministry of Agriculture, Dokki , Cairo, Egypt

SUMMRY

A total of 1226 normal first lactation records of Egyptian buffaloes kept at Mehallet Mousa farm, belonging to Ministry of Agriculture, during the period from 1965 to 1985 were used in this investigation. Genetic and phenotypic parameters of total milk yield (TMY), lactation period (LP) and age at first calving (AFC) were estimated by MTDFREML using an animal model. The model included individual, and error terms as random effects, month and year of calving as fixed effects and age at first calving as a covariate . Estimates of heritability were 0.43, 0.14 and 0.25 for TMY, LP and AFC, respectively. Predicted breeding values of cows (CBV) ranged from -263 to 376 kg for TMY, -52 to 79 d for LP and -1.8 to 6.3 mo. for AFC. Also, predicted breeding values of sires (SBV), ranged between -211 and 407 kg, -26 and 33 d and -2.0 and 5.0 mo., for the same traits, respectively. Similarly, predicted breeding values of dams (DBV) ranged from -141 to 118 kg, -28 to 49, d and -2.5 to 5.0 mo. for the above mentioned traits, respectively. Product moment correlations between LP and TMY through CBV, SBV and DBV were positive highly significant, ranged from 0.984 to 0.994. Where it was negative and high will the range from -0.980 to - 1.000 for AFC and both LP and TMY.

Keywords: *Genetic analysis, animal model, Egyptian buffaloes*

INTRODUCTION

Estimates of genetic parameters for yield traits of dairy cows obtained using sire models are frequent in the literature. Genetic variance might be underestimated if selection intensity is larger for males than for females because analyses with sire models accounted only for genetic variance of sires (Albuquerque *et al.* ,1995). Animal Model take into account differential selection of males and females and might provide more accurate estimates of parameters than do sire model.

For dairy cattle improvement, prediction of breeding values with an animal model instead of computation of separate genetic evaluations for cows and bulls is becoming common (Suzuki and Van Vleck, 1994). The animal model is the procedure used to evaluate genetic merit of dairy animals for production. It's calculation starts with the cow as source of production information.

In Egypt few studies have been carried out to evaluate breeding values for milk traits in Egyptian buffaloes. Khattab and Mourad (1992) analyzed 1180 normal lactation records of Egyptian buffaloes and estimated sire transmitting ability for total milk yield and lactation period using BLUP without relationship matrix, while Gebriel (1996) estimated cow and dam transmitting ability for 305 day milk yield and lactation period by using single trait animal model.

The objectives of the present study were to estimate the genetic parameters and predict breeding values of first lactation performance traits of Egyptian buffaloes (total milk yield, lactation period and age at first calving) by using multi trait animal model.

MATERIAL AND METHODS

Data

Data of 1226 first lactation records of Egyptian buffaloes raised at Mahallet Mousa Experimental Station of the Animal Production Research Institute, Egyptian Ministry of Agriculture, Egypt were used in the present study. Records covered the period from 1965 to 1985. Number of sires and dams were 110 and 1012, respectively. Cows were mated naturally. Artificial insemination was only practiced when there was a probability of genital disease infection. Pregnancy was detected by rectal palpation 60 days after the last service. Abnormal records affected by disease or by abortion were excluded. Traits studied were total milk yield in kg (TMY), lactation period in days (LP) and age at first calving in months (AFC).

Animals were allowed to graze during the period from December to May. During the rest of the year, they were given pelleted concentrates and rice straw. Cows producing more than 10 kg and those that were in the past two months of pregnancy were supplemented with extra concentrate ration. Buffaloes were hand milked twice a day.

Analysis

Data were analyzed by Multiple Trait Derivative Free Restricted Maximum Likelihood (MTDFREML) according to Boldman *et al.*(1995), using single and multiple trait Animal Model. Table 1. shows the data structure considered in the analysis as well as the means of total milk yield (TMY) in kg, lactation period (LP) in days and age at first calving (AFC) in months. The analysis was stopped (terminated) when it reached the attained with convergence criterion of 1983 rounds of iterations.

Firstly, traits were analyzed using single trait animal model using mean literature values as start values as estimated by Tonhati *et al.*, 2000. Secondly, variances of genetic and error (residual) effects obtained from the analysis of single trait animal model were used as start values in multi trait animal model, where, the genetic and residual covariances were obtained by using Mixed Model Least Squares and Maximum Likelihood (LSMLMW) computer program of Harvey (1987) .

Table 1. Data structure, means ($\overline{X}$), standard deviation (SD) and coefficient of variation (CV%) for total milk yield (TMY), lactation period (LP) and age at first calving (AFC)

Traits	$\overline{X}$	SD	CV%
TMY, kg	1253	468	37.4
LP, d	313	113	36.2
AFC, mo.	39	6	16.4
Observations			
No. of records	1226		
No. of cows	1226		
No. of sires	110		
No. of dams	1012		
Animals in relationship matrix, no. A^{-1}	2348		
Mixed model equations, No. MME	7154		
No. of iterations	1983		

The multi trait animal model which are used to analyses TMY, LP and AFC included individual and error terms as random effects, month and year of calving as fixed effects and age at first calving as a covariate. The mixed model equations are given in detail by El-Arian *et al.* (2002).

In matrix notation the animal model used was:

$$Y = XB + Zg + e$$

Where:

Y = observation vector of animals, B = fixed effects vector (i.g., month and year of calving and age at first calving) , g= animal direct genetic effect vector, and e = residual effect vector, X and Z are incidence matrices, and

$$E\begin{pmatrix} a \\ e \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$V\begin{pmatrix} a \\ e \end{pmatrix} = \begin{pmatrix} A\sigma^2_{a1} & A\sigma_{a12} & 0 & 0 & 0 & 0 \\ A\sigma_{a21} & A\sigma^2_{a2} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & I\sigma^2_{e1} & I\sigma_{e12} \\ 0 & 0 & 0 & 0 & I\sigma_{e21} & I\sigma^2_{e2} \end{pmatrix}$$

To estimate heritability (h^2) coefficient, the following equation was used:

$$h^2 = \sigma^2_a / (\sigma^2_a + \sigma^2_e),$$

Where:

σ^2_a = additive genetic variance and σ^2_e = temporary environmental variance.

Breeding values were calculated from 1226 cows, fathered by 110 sires and mothered by 1012 dams. The mixed model equation (MME) for the best linear unbiased estimator (BLUE) for estimable function for the best linear unbiased prediction (BLUP) was in matrix notation as follows:

$$\begin{bmatrix} X'X & X'Z & X'W \\ Z'X & Z'Z+A^{-1}\alpha_1 & Z'W \\ W'X & W'Z & W'W+I\alpha_2 \end{bmatrix} \begin{bmatrix} \hat{b} \\ \hat{\mu}_a \\ \hat{\mu}_e \end{bmatrix} = \begin{bmatrix} X'y \\ Z'_a y \\ W'_e y \end{bmatrix}$$

Where:

$$X=\begin{bmatrix} X_1 & 0 \\ 0 & X_2 \end{bmatrix}, Z=\begin{bmatrix} Z_{a1} & 0 & Z_{E1} & 0 \\ 0 & Z_{a2} & 0 & Z_{E2} \end{bmatrix}, \hat{b}=\begin{bmatrix} \hat{b}_1 \\ \hat{b}_2 \end{bmatrix}, \hat{\mu}=\begin{bmatrix} \hat{\mu}_{a1} \\ \hat{\mu}_{a2} \\ \hat{\mu}_{1} \\ \hat{\mu}_{e2} \end{bmatrix}$$ and

$$y=\begin{bmatrix} y_1 \\ y_2 \end{bmatrix}$$

RESULTS AND DISCUSSION

Estimates of CV% given in Table 1 for TMY, LP and AFC were 37.4, 36.2 and 16.4%, respectively. These estimates are lower than those recorded by Khalil *et al.* (1992), 43.0% for TMY and higher than that reported for TMY (31.6%) of Indian buffaloes by El-Arian (2001). The value of CV% of LP was higher than those of Khalil *et al.* (1992) for Egyptian buffaloes. (30.71) and El-Arian (2001) for Indian buffaloes (21.5%).

The mean of TMY in Table 1 was 1253 kg produced in an average lactation period (LP) of 313 days. The average TMY was close to the 1249 kg in 295 days reported by Khalil *et al.* (1992), but higher than that of Mostageer *et al.* (1981) 1160 kg in 199 days in Egyptian buffaloes. The present estimate of TMY is lower than the estimate of 2131 kg and 1496 kg reported by Pagnacco *et al.* (1992) and Tonhati *et al.* (2000) working on Italian and Brazilian buffaloes, respectively.

The mean of AFC was 39.0 months (Table 1). The present mean is close to the estimate found by Tonhati *et al.* (2000) (39 mo.) and Khalil *et al.*(1992) (38 mo.)

For multi trait animal model, the structure of data (No. of cows, No. of sires, No. of dams , Mixed Model equations (MME) and No. of iterations are presented in Table 1. The average number of equations and iterations recorded were 7154 and 1983, respectively. Results of the present study are higher than those estimated from single trait animal model found by Salem (1998) working on Holstein Friesian cows in Egypt. The author reported that the number of iterations for TMY and LP were 214 and 127, respectively. The higher number of iterations in the present study may be due to using three traits in the same analysis and considering also genetic covariances and errors covariances among these traits. In this respect, Swalve and Van Vleck (1987) used records of 4000 cows to estimate genetic parameters for milk yields of first, second and third lactations with an animal model used only 18 rounds of iteration and Albuquerque *et al.* (1995) stopped his analysis after 300 rounds of iteration. In general, number of iterations required to reach convergence could be affected by the number of animals, the number of random factors in the model and traits studied.

The heritability estimates were 0.43, 0.14 and 0.25 for TMY, LP and AFC, respectively, (Table 2). These estimates indicate that 43, and 25% of the total variation observed in TMY and AFC, respectively, are due to additive genetic variance. The moderate h^2 estimates for TMY and AFC suggested that efforts could be made to bring about improvement in those two important economic traits through individual selection as well as better managerial practices. Lower h^2 estimate for LP (0.14) indicated that this trait is affected mainly by environmental factors. In addition, great improvement in this trait could be possible by improving feeding and management system. In this respect, Tonhati *et al.* (2000) on Murrah buffaloes in Brazil, found that h^2 estimates for TMY and AFC were 0.38 and 0.20, respectively. The authors concluded that the genetic change for these traits is possible by selecting the most productive animals. They found that heritability estimate for LP was 0.01, which indicated that the genetic variation among individuals is practically nil. Individual differences with respect to this trait could be reduced by management and breeding practices.

Table 2. Estimates of variance and covariance components, heritability (h^2), and genetic correlation (r_G) for total milk yield (TMY), lactation period (LP) and age at first calving (AFC)

Estimate	Traits		
	TMY, kg	**LP, d**	**AFC, d**
σ^2_a	27227	2195	9.00
σ_a TMY with		5894	-344
σ_a LP with			-9.3
σ^2_e	36294	13817	26.4
σ_e TMY with		1851	-957
σ_e LP with			-72.3
h^2	0.43	0.14	0.25
r_G TMY with		0.76	-0.70
r_G LP with			-0.07

σ^2_a =additive genetic variance; σ_a = genetic covariances, σ^2_e = residual variance and σ_e = residual covariances.

On the other hand, lower estimates of heritability for milk yield, age at first calving and lactation period were reported by Thevamanoharana (2003) working on 3195 lactation records of 1183 Nili - Ravi buffaloes. The authors suggested that most of the observed variation in milk trait collateral relatives and progeny test should be used in selection programs . The improvement of these traits may be achieved by better environmental conditions, i.e. better feeding, better management, reduction of heat stress, better control of diseases including vaccination programmes and wide spread milk recording and testing systems.

In general, heritability estimates obtained in the present study are higher than those reported with sire model by Khattab and Mourad (1992) (h^2 of TMY = 0.17, LP = 0.13 for Egyptian buffaloes, (Khalil *et al.* 1992) (h^2 of TMY = 0.015, LP = 0.032) for Egyptian buffaloes, El-Arian (2001) 0.29 for TMY and 0.04 for LP in Indian buffaloes and El-Arian *et al.* (2001) h^2 0.21 for TMY in Egyptian buffaloes. The estimate of h^2 for AFC was similar to that found by Shashidhara *et al.* (1999) being 0.25 in Surti buffaloes.

Genetic correlations

The results in Table 2 show that the genetic correlation between TMY and LP was positive and high (0.76) which was in the desirable direction, indicating that high yielding buffaloes are also having the longer LP. This correlation suggests that selection for higher yielding cows in their first lactation would cause a correlated increase in their first lactation period. Khattab and Mourad (1992) arrived at the same conclusion. The genetic correlation between TMY and AFC was negative and high (-0.70) and suggested that selection for high yielding buffalo cows would cause a correlated decrease in their age at first calving (AFC). Similarly, the genetic correlation between LP and AFC was negative (-0.07). The results was quite expected and leads to suggest that selection for higher productivity would be correlated with longer LP and younger AFC. A reduction of AFC is a desirable goal of dairymen and will help in minimizing the cost of raising breeding heifers, shortening the generation interval and maximizing the number of lactations per cow. The results was in close agreement with Khattab and Mourad (1992) and El-Arian *et al.* (2001) on Egyptian buffaloes. On the other hand, Tonhati *et al.* (2000) working on Murrah buffaloes in Brazil, found that the genetic correlations between AFC and each of TMY and LP were 0.63 and 0.33. They suggested that, when milk yield is the selection variable there could be an increase of AFC and LP. Their results revealed that TMY and AFC could be considered independently in planning buffalo selection programs.

Predicted Breeding Values (PBV' s)

Estimates of minimum, maximum and range of predicted breeding values and their accuracies for TMY, LP and AFC calculated for cows (CBV ' s), sires (SBV' s) and dams (DBV's)using multi trait animal model are presented in Table 3. The results showed that the range of CBV' s being 639 kg, 131 days and 8.1 months for TMY, LP and AFC, respectively, representing to 51.0%, 41.9% and 20.8% of the herd average, respectively.

It is clear that the accuracy of sire breeding value (SBV's) ranges from 35-90% which was higher than the accuracy of both CBV' s (53-82%) and DBV' s (35-69%). The accuracy of sire breeding value was higher than that of cow breeding value as well as dam breeding value, which may be due to higher number of daughters per sire. In this respect , Khattab *et al.* (1987) found that the greatest sire evaluation for 305 day milk yield were obtained from a bull with 20 daughters. The same authors, concluded that the accuracy of sire evaluation increases as the number of daughters per sire increases.

In addition, the accuracy of minimum and maximum estimates of breeding values of CBV' s , SBV' s and DBV' s for TMY obtained by multi - trait animal model (Table 3) are higher than those compared to single - trait animal model obtained by Khattab *et al.* (2003) ranged from 33 to 51 % for CBV' s , from 16 to 70 %for SBV' s and from 15 to 40 %for DBV' s. The higher accuracy for multi - trait animal model may be due to consider the covariance among traits studies. Mrode (1996) reported

Table 3. Range of predicted breeding values of cows (CBV's), sires (SBV' s) and dams (DBV' s) and its accuracy for total milk yield (TMY), lactation period (LP) and age at first calving (AFC)

Trait	CBV' s				SBV' s				DBV's			
	Min.	Max.	Range	Accuracy	Min.	Max.	Range	Accuracy	Min.	Max.	Range	Accuracy
TMY	-263±10	376±10	639	80-82	-211±10	407±11	618	51-90	-141±14	118±14	259	45-56
LP	-52±8	79±10	131	64-81	-26±4	33±3	59	68-88	-28±4	49±4	77	56-69
AFC	-1.8±0.3	6.3±0.5	8.1	53-55	-2±0.2	5±0.4	7	35-64	-2.5±0.3	5±0.3	7.5	35-40

that selection bias can be the result of a single - trait analysis which does not include the information upon which selection was practiced. The author added that a multi - trait evaluation is the optimum methodology to evaluate animals using all traits, because it accounts for the relationship among them. Hanaa Abdelharith *et al.* (2002) estimated breeding values for 305 day milk yield of Friesian cattle in Egypt, using multiple - trait and single trait animal model analyses, found that the accuracy was higher in the multiple - trait analyses by 6.33 % than in the single - trait analysis. The authors concluded that using the multiple - trait analyses is recommended to obtain more accurate breeding values for 305 day milk yield because it make use of all the information about the lactations and the covariances among them as well as the relationships between the relatives in the different traits.

The range of SBV'S for the same traits were 618 kg, 59 d. and 7.0 mo. respectively with the percent of 49.0%, 18.8% and 17.9% from the herd average, respectively. The range of DBV' s were 259 kg for TMY, 77 d. for LP and 7.5 mo. for AFC (representing for 20.7%, 24% and 19.2% of the herd average, respectively). The present results show large differences among breeding values of cows, sires and dams in different traits studied. Thus , the improvement of milk production and age at first calving through selection is possible. Genetic progress can be achieved if the farms adopts test for the genetic evaluation of sires and cows. Similarly, Cady *et al.* (1983) working on 5716 lactation records of Nile Ravi buffaloes in Pakistan, found that the predicted sire transmitting ability for 305 day milk yields ranged from -173 to 260 kg. In addition, Kassab (1988) using 1564 lactation records of Egyptian buffaloes, reported that the predicted sire transmitting ability for 305 day milk yield, ranged from -297 to 346 kg.

In addition, Khattab and Mourad (1992) using another data set on Egyptian buffaloes, estimated sire values without A^{-1} for TMY and LP. The authors found that BLUP values as deviation from the mean ranged from 147 to 154 kg for TMY and from -20 to 31 d, for LP. The present estimates are lower than those obtained by Gebriel (1996) working on Egyptian buffaloes using single trait animal model . The author found that the range of transmitting abilities of buffalo cows for 305 day milk yield and LP were 642.9 kg and 85.05 d, respectively, and the range of transmitting ability of buffalo cows for 305 day milk yield and LP were 361.0 kg and 43.52 d, respectively. The present results show that predicted breeding values of cows , sires and dams positive values for TMY are also in most cases positive values for LP and negative values for AFC. These results indicate that selection for TMY for top cows, sires and dams will increase LP and decrease AFC in the next generation and this is a goal of dairymen.

Results of the present results (Table 3) show that the importance of cows, since it gave the higher range of breeding values for TMY, LP and AFC than dams breeding values. Thus, selection for cows for the next generation in maternal line would place emphasis on good genetic maternal effects in addition to good estimates of breeding value. In addition, the accuracy of minimum and maximum estimates of predicting breeding values for dams (35 to 69 %, Table 3) indicating that these estimates were lower than those obtained for cows from (53 to 82 %, Table 3). This may be due to a small amount of information available for each dam (i.e., small numbers of progeny per dam) . In addition, due to high accuracy of predicted breeding values of sires (Table 3), then it is necessary to depend on sire for estimated breeding values, and low accuracy of predicted breeding values of dams , indicate that dams are less important than sires and cows for estimating breeding values. In this respect, Sadek (1994) concluded that sire and / or maternal grand sire were best predictors for bull either separately or in combination. Adding dam to the model reduced the accuracy and changed the regression coefficients for sire and maternal grand sire.

On the other hand, Tonhati *et al*. (2000) on Murrah buffaloes, estimated breeding values of cows, dams and sires by using single trait animal model for milk yield, lactation period and age at first calving , concluded that the average breeding values of cows, dams and sires for different traits studied were around zero, which indicated that selection in such cases was not effective. The same authors suggested that there were some difficulties on sires selection for milk yield and that more wide - range tests for genetic evaluations of sires are needed.

Table 4. Product moment correlations among breeding values of total milk yield (TMY), lactation period (LP) and age at first calving (AFC) of Cows, sires and dams

Trait	Traits					
	CBV's		SBV's		DBV's	
	TMY	**LP**	**TMY**	**LP**	**TMY**	**LP**
LP	0.986**		0.984**		0.994**	
AFC	-0.999**	-0.980**	-0.999**	-0.976**	-1.000**	-0.992**

Table 4. Showed that the product moment correlations trend for CBV's, SBV's and DBV's were nearly the same. It was positive and high and ranged from 0.984 to 0.994 for TMY with LP, where it was negative and high with the range from -0.976 to - 1.000 for AFC with both TMY and LP. The product moment correlations trend of predicted breeding values were in the same direction with those reported for genetic correlation for the same traits (Table 2). It could be concluded that improvement of milk production and age at first calving through selection is possible and selection against age at first calving would lead to an increasing milk yield and lactation period. In addition, selection of more precocious individuals would be effective and contribute to decrease the generation interval, and consequently help to improve all traits.

This study represent the first attempt for estimating breeding values of milk traits of Egyptian buffaloes kept at Mehallet Mousa farm, using multi trait animal model, from different sources of pedigree. This station is one of the main sources for providing the farmers by proven sires. Therefore, more research work in this respect is needed by using a large date sets and including another milk traits such as fat and protein yields.

REFFERENCES

Albuquerque, L.G.; Dimov, G.; Keown, J.F and L.D. Van Vleck, 1995. Estimates using an animal model of (co) variances for yields of milk, fat and protein for the first lactation of Holstein cows in California and New York. J. Dairy Sci., 78: 1591 - 1596.

Boldman, K.G.; Kriese, L. A.; 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 covariance (DRAFT). U.S. Department of Agriculture/ Agricultural Research Service. 114pp..

Cady, R. A. I S. K. Shah, E. C. Schermerhorn and R. E. McDowell, 1983. Factors affecting performance of Nile - Ravi buffaloes in Pakistan J. Dairy Sci., 66 : 578 - 586.

El-Arian, M. N., 2001. Genetic evaluation for lifetime production and longevity traits of Murrah buffaloes. J. Agric. Sci, Mansoura Univ., 26 : 1344 - 1361.

El-Arian, M. N., K. A. Mourad and A.S. Khattab, 2001. A comparison of different selection indices for genetic improvement of some milk traits in a herd of Egyptian buffaloes. J. Agric. Sci. Mansoura Univ. 26 : 2687 - 2695.

El-Arian, M. N., El-Awady, H.G. and A. S. Khattab, 2002. Predicting breeding values of milk production traits using an animal model of Friesian cows in Egypt. 53rd Annual Meeting of the European Association of Animal Production, Cairo, Egypt, 1-4 September.

Gebriel, E. A.A, 1992. Study on the prediction of buffalo cow transmitting ability. M. Sc., Thesis, Faculty of Agriculture Ain Shams University, Cairo, Egypt.(cited by Salem , 1998).

Hanaa Abdelharith, H. Mansour, E.A. El-Tawil and M. F. Adel Gelil, 2002. Different animal models for estimating breeding values using earlier records in a Friesian herd in Egypt. Egyptian. J. Anim. Prod. 39 : 9 -19.

Harvey, W.R., 1987 User's Guide for LSMLMW , Mixed Model Least Squares and Maximum Likelihood Computer Program. PC -2 Version. Ohio State University Columbus (Mimeograph) , USA.

Kassab, M. S., 1988. Studies of buffaloes in Egypt. Ph. D. , Thesis, Faculty of Agriculture, Kafr El - Sheikh, Tanta University, Egypt. 143pp.

Khalil, M.H., E.A., Afifi, L.H., Bedeir, and S. M. Zeidan, 1992. Genetic analysis of lactation traits in Egyptian buffaloes. Egyptian J. Anim. Prod. 29: 155- 172.

Khattab, A.S., H. Atil and L. Badawy, 2003. Variances of direct and maternal genetic effects for milk yield in a herd of Friesian cattle in Egypt. The second International Biometric Society Conference of the Eastern Mediterranean Region , Antalya, Turkey, January, 2003.

Khattab, A.S., M.M.S. Mabrouk and A.M. El-Hakim, 1987. Lactation records adjusted for days open in sire evaluation. J. Agric. Res. Tanta Univ., 13: 286-296.

Khattab, A.S. and K.A. Mourad, 1992. Estimation of genetic parameters and genetic trends for some milk traits in a herd of Egyptian buffaloes. Egyptian J. Anim. Prod. 29 : 33- 44.

Mrode, R. A., 1996. Linear model for the prediction of animal breeding value. CAB, International , Walling Ford Oxon Ox 108 DE UK, 184pp.

Mostageer, A., M. A. Morsy., R.R. Sadek, 1981. The production characteristics of a herd of Egyptian buffaloes. Z. Tierzuchtg. Zuchtgsbiol. 98 : 220 - 236.

Pagnacco, G., A. Bagnata, B.M. Moih and Pilla, A.M, 1992. Heritability and genetic correlations for milk, fat and protein in buffaloes with multi trait sire model. International Symposium on Prospects of buffalo production in the Mediterranean/Middle East , Cairo 1992.

Sadek, M. H., 1994. Accuracy of pedigree selection. Egypt. J. Anim. Prod. 31 : 307 - 315.

Salem, M.A, 1998. Evaluation of milk production traits for cows of commercial dairy herds in Egypt. Ph.D. Thesis, Faculty of Agriculture at Moshtoher, Zagazig University, Banha, Branch, Egypt. 138pp.

Shashidhara, T., Bhatia, S.S., Appannavar, M.M, 1999. Genetic analysis of age at first calving in Surti buffaloes. Indian Vet. J., 76 :342-343.

Suzuki, M. and L.D. Van Vleck, 1994. Heritability and repeatability for milk production traits of Japanese Holstein from an animal model. J. Dairy Sci., 77: 583 - 588.

Swalve, H., and L.D. Van Vleck, 1987. Estimation of genetic (co) variances for milk yield in first three lactations using an animal model and restricted maximum likelihood. J. Dairy Sci., 70 : 842 - 849.

Thevamanoharan, K., 2003. Genetic analysis of performance traits of Swamp and Riverine buffalo. Buffalo Newsletter, 18 : 11 (Abstract).

Tonhati, H., F.B.Vasconcellos and L.G. Albuquerque, 2000. Genetic aspects of productive and reproductive traits in a Murrah buffaloes herd in Sao-Paulo, Brazil. J. Anim. Breed. Genet., 117:331-336.

التحلـــيل الوراثـــى لـــبعض الصفات الإنتاجية فى قطيع من الجاموس المصرى باستخدام نموذج الحيوان

عادل صلاح خطـــاب[1] ، حســـن غازي العـــوضى[2] ، محمـــد نجيب العريان[3] و كوثر عبد المنعم مراد[4]
١- قسم الإنتاج الحيواني - كليه الزراعة بطنطا-جامعة طنطا - مصر، ٢- قسم الإنتاج الحيواني - كليه الزراعة بكفـر الشـيخ - جامعـة طنطا - مصر، ٣- قسم الإنتاج الحيواني - كليه الزراعة - جامعة المنصـورة مصر، ٤- معهد بحوث الانتاج الحيوانى وزارة الزراعة الدقى القاهرة

فى هذه الدراسة تم تحليل بعض الصفات الإنتاجية الهامة فى قطيع من الجاموس المصرى بمزرعة محلة موسى باستخدام ١٢٢٦ سجلا للموسم الأول خلال الفترة من ١٩٦٥ حتى ١٩٨٥. وتم تقدير المعايير الوراثـية والمظهـرية لإنـتاج اللبن ، طول موسم الحليب والعمر عند أول ولادة بواسطة نموذج الحيوان باسـتخدام بـرنامج MTDFREML لـ Boldman *et al.*, (1995) واشتمل نموذج التحليل على سنة وشـهر الـولادة كعوامـل ثابتة والعمر عند أول ولادة كانحدار خطى وكل من الحيوان والخطأ العشوائى كعوامل عشوائية. وكانت النتائج كالتالى:

كانت تقديرات المكافئ الوراثى ٠,٤٣ ، ٠,١٤ و ٠,٢٥ لإنتاج اللبن ، طول موسم الحليب والعمر عند أول ولادة على التوالى . تراوحت القيم التربوية للأبقار من -٢٦٣ إلى ٣٧٦ كجم لإنتاج اللبن ومن -٥٢ إلى ٧٩ يوم لطول موسم الحليب ومن -١,٨ إلى ٦,٣ شهور للعمر عند أول ولادة. أيضا تراوحت القيم الـتربوية للطلائق من -٢١١ إلى ٤٠٧ كجم ومن -٢٦ إلى ٣٣ يوم ومن -٢ إلى ٥ شهور لنفس الصفات السـابقة على التوالى. بينما تراوحت القيم التربوية للأمهات من -١٤١ الى ١١٨ كجم لانتاج اللبن ومن -٢٨ الى ٤٩ يوم لطول موسم الحليب ومن-٢,٥ الى ٥,٠٠ شهر للعمر عند أول ولادة.

كان قيمة معامل الارتباط الوراثى بين إنتاج اللبن الكلى وطول موسم الحليب موجبا وعالى المعنوية (٧٦و) بيـنما معـامل الارتباط الوراثى بين العمر عند أول ولادة وكل من إنتاج اللبن الكلى وطول موسم الحليـب سالبا وعالى المعنوية (- ٧٠و ، -٧٠و على التوالى). تراوحت قيم معاملات الارتباطات للقيم التربوية لكل من الأبقار الأباء و الأمهات بين إنتاج اللبن الكلى وطول موسم الحليب بين ٩٨٤و إلى ٩٩٤ و بيـنما تراوحت من - ٩٨٠و إلى -١ بين العمر عند أول ولادة وكل من إنتاج اللبن الكلى وطول موسم الحليب .