GENETIC AND ECONOMIC EVALUATION FOR THE RELATIONSHIP BETWEEN SOMATIC CELL COUNTS, MILK YIELD AND MILK CONSTITUENTS IN EGYPTIAN BUFFALOES

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ABSTRACT

This study aimed to evaluate the effects of somatic cell count (SCC) on buffalo milk and milk components. Data on 3054 lactation records of 506 Egyptian buffalo analyzed. Month and year of calving, parity, herd, stage of lactation and type of milking were used as fixed effects, animal, permanent environmental and residuals as random effects in the analytical model. Means of total milk yield TMY, percentages of fat F%, protein P%, lactose Lact% and total solids TS% and SCC were 2262 kg, 6.8%, 3.9%, 4.8%, 15.5% and 168,232 cell/ml milk, respectively. Milk yield didn't affected by SCC till 600,000 cells/ml milk. Losses in lactationally milk yield return per buffalo cow due to increase the SCC from 1 million to 4 millions cells/ml milk ranged from 192.96 to 503.24 EGP (EGP=0.156 USD). Heritability estimates for TMY, F%, P%, Lact%, TS% and SCC were 0.34, 0.46, 0.35, 0.48, 0.38 and 0.23, respectively. Genetic correlations between TMY and other traits studied were negative, ranging from -0.04 to -0.46. Positive genetic correlations (0.07 to 0.53) obtained among percentage traits except between F% and P% was negative (-0.61).

Breeding values of sires ranged from -687 to 543 kg for TMY, -0.58 to 1.21% for F%, -0.58 to 0.57% for P%, -0.56 to 1.03% for Lact%, -1.21 to 1.61% for TS% and -146,000 to 371,000 cell/ml for SCC. Results concluded that moderate heritability of SCC and the antagonism relationship between SCC and TMY indicated that could be improve together through selection with improve the environmental conditions.

Keywords: Egyptian buffaloes, breeding values, heritability, genetic correlation, somatic cell count

INTRODUCTION

Buffaloes are outstanding domestic animals because their milk having higher fat and solids not fat contents. The analysis of biochemical milk composition and SCC is very important for the dairy industry to draw out guidelines and recommendations on milk quality. So far buffaloes–important milk animals–have not been exploited to a great extent for SCC and biochemical composition of milk. However, the buffalo considered the main dairy animal in Egypt. Numbers of buffaloes about 4.5 million buffaloes (International Farm Comparison Network, 2009), contributing approximately 70% of the total milk in the Egypt. Intramammary infection in most important factors influencing the SCC, as well as, milk production can be affected by other

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factors such as herd, type of milking, climate, season and year of calving and management (Lehtolainen *et al*., 2003; El-Awady, 2009).

In buffaloes, susceptibility to mastitis is low comparison with that in the cows due to the strong teat sphincter in buffaloes that hindered ease of milking and this many explained by that the teat sphincter considerably prevent pathogens penetration into the teat canal hence it reduce relatively incidence of mastitis, however under bad management conditions in rural areas, the percent of clinical and sub clinical mastitis were estimated as 5.3 and 36.2% respectively (Youssef *et al*., 2008).

Total average cost of therapy in the management of mastitis was highly economical in Nili-Ravi buffaloes (Varshney and Naresh, 2003). In India, the prevalence of clinical mastitis in buffaloes has been estimated to be 12.2% and the loss of US8.8$ per buffalo per lactation due to mastitis speaks of its tremendous economic losses due to reduced milk without considering the cost of disease management (Thirunavkarsu and Prabaharan, 2000).

All the developed countries are using milk SCC as a marker to determine the mammary health and quality of milk (Dang and Anand, 2007). Tracking is important for controlling mastitis in herds, due to the economic loss caused by the disease (Philpot, 2002). Mastitis positively correlates to SCC in milk, which turns this test widely accepted as a determinant in milk quality. There is not widespread information about SCC in buffalo milk in Egypt. Therefore, the objective of this study was to evaluate the SCC of milk buffalo and its influence on its components. Also evaluate the genetic and phenotypic relationships between SCC, milk and milk constituents.

MATERIALS AND METHODS

Data and management of herds

A total of 3054 lactation records of 506 lactating Egyptian buffalo cows mated by 103 sires raised at Mehallet Mousa Experimental Station of the Animal Production Research Institute (APRI), Ministry of Agriculture, Egypt, were used in the present study after editing. Records covered the period from 2001 to 2007. Numbers of daughters per sire were 29.21. Buffalo 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. Data concerning total milk yield (TMY), percentage of fat (F%), protein (P%), lactose (Lact%) and total solids (TS%) and somatic cell counts (SCC).

Animals were kept under semi-open sheds. Lactating buffaloes were milked by hand or machine twice daily at 7.00 AM and 4.00 PM throughout the lactation period, and milk production was recorded daily. Buffaloes were maintained under the same system of feeding in the farm. The animals were grazed on Egyptian clover (*Trifolium Alexandrinum*) during December to May with concentrate mixture and rice straw. While during June to November, animals were fed on concentrate mixture, rice straw and limited amount of clover hay and/or silage. Animals were feed according to their live weight, milk production and pregnancy status. The concentrate feed mixture was given twice daily before milking, while rice straw was offered once daily at 9.00 AM, whereas clover hay or (silage) in summer was offered at 11.00 AM. Animals were allowed to drink water three times a day from water troughs. Multi mineral licking blocks were available for animals in the stalls.

Sampling of SCC

Milk samples were collected aseptically monthly basis from each lactating animal for SCC and chemical analysis of milk constituent. The SCC was measured by [Fossomatic 5000 (Foss electric A/S 69, stangerupade DK 3400 Hilleroed, Denmark Comp.)] from a sample of milk collected during the morning milking. The determinations of the SCC were performed in Dairy Services Unit which belongs to the (APRI), Sakha, Kafr El-sheikh Government. SCC was arithmetic mean monthly from calving to the end of lactation expressed as 1000 cells/ml milk. Production of milk (kg), F%, P%, lact% and TS% were based on completed lactations.

Economic losses

The economic losses due to increasing the levels of SCC measured by losses in milk returns than the normal animal as the follow equation: Milk returns = selling price of one kg milk * milk production losses. Which the selling price of one kg of milk equal 4.00 LE (EGP) according estimation of Mehallet Mousa farm (one $US = 6.40 Egyptian pound (EGP) on the basis average of 2012 prices).

Statistical analysis

Data were first analyzed using least squares analysis of variance (Harvey, 1990) in order to determine the fixed effects to be included in the analytical model.

Fixed effects

Least squares means and analysis of variance of non-genetic effects on studied traits were estimated by using least squares analyses of variance by Mixed Model program of Harvey, 1990. Data set 1 were analyzed to estimate the effects of month and year of calving, parity, stage of lactation, herd and type of milk on different traits studied. The following mixed model (1) was used:

$$Y_{ijklmno} = m + M_i + Y_j + P_k + ST_l + H_m + TY_n + \beta(AFC) + + e_{ijklmno} \quad (1)$$

Where: $Y_{ijklmno}$ = observation of total milk yield, TMY, F%, P%, Lact%, TS% and SCC;

m = Overall mean,

M_i = fixed effect of i^{th} month of calving (i=1,…, 12);

Y_j = fixed effect of j^{th} year of calving (k =2001,…, 2007);

P_k = fixed effect of k^{th} parity (lactation order) (l =1,…, 10);

ST_l = fixed effect of l^{th} stage of lactation (1,…, 4) (1) from 1 to 90 day, (2) from 91 to 180 day, (3) from 181 to 270 day and (4) from 271 to 360 day after calving;

H_m = fixed effect of m^{th} herd (1,…, 3) (1) Mehallet Mousa El-Gadyd, (2) Mehallet Mousa and (3) Mehallet Mousa El Kadim);

TY_n = fixed effect of n^{th} type of milking (1= handing and 2 = machine);

$\beta(AFC)$ = the regression coefficient of the studied traits on age at first calving and

$e_{ijklmno}$ = random error variance.

Data set 2 were analyzed to estimate the effect of SCC on losses in milk production and milk constituents as well as the relationship between SCC different traits studied. The following mixed model (2) was used:

$$Y_{ijklmnop} = m + M_i + Y_j + P_k + ST_l + H_m + TY_n + X_o + e_{ijklmnop} \quad (2)$$

Where: $Y_{ijklmno}$ = observation of a, TMY, F%, P%, Lact% and TS%;

X_o = fixed effect of SCC levels (o= ≤50,000, 100,000, 200,000, 400,000, 600,000, 800,000, 1000,000, 2000,000, and 4000,000 cell/ml milk) and the other symbols as defined in the model (1).

Estimation of genetic parameters

(Co)variance components were calculated by Restricted Maximum Likelihood employing a simplex algorithm to search for variance components to minimize -2log likelihood (L). Convergence was assumed when the variance of the function values (-2log L) of the simplex was less than 10^{-9}. After the convergence, a restart was performed to verify that it was not a local minimum. Restarts were performed for all analyses, using the final results of the previous analysis, in order to locate the global maximum for the log likelihoods. Starting values for variance components for multi-trait analyses were obtained from literature.

Covariance components were estimated for univariate and bivariate analysis for all traits with derivative-free restricted maximum likelihood (REML) procedures using the MTDFREML program of Boldman *et al.* 1995.

The basic multiple model was

$$Y = X\beta + Zd + Wp_e + e$$

Where: Y is a vector of observations, β = is a vector of fixed effects with incidence matrix X. d ~ NID (0, A σ^2_d) is a vector of direct additive genetic effect with incidence matrix Z, Pe ~ NID (0, $I_c\ \sigma^2_{pe}$) is a vector of random maternal permanent environmental effects with incidence matrix W, and e ~ NID (0, $I_n\ \sigma^2_e$) is a vector of random residual effects. Also, σ^2_d is the direct additive genetic variance; σ^2_{pe} is the maternal permanent environmental variance, σ^2_e. is the residual variance (temporary environment), A is the additive relationship matrix, I_c and I_n are identity matrices of order equal to the number of maternal permanent environmental effects and the number of records, respectively.

Heritability (h^2) was estimated from the equation:

$$h^2 = \sigma^2_d/(\sigma^2_d + \sigma^2_{pe} + \sigma^2_e)$$

Convergence reached when the simplex variance was less than 10^{-9} and then several extra rounds of iterations were executed to ensure that a global maximum was reached. Best linear unbiased predictions (BLUP) of estimated breeding values (EBV's) were calculated by back-solution using the MTDFREML programme for all animals in the pedigree file for multi-traits analysis.

RESULTS AND DISCUSSION

Unadjusted means

Actual means, standard deviations and coefficients of variability for different traits studied are present in Table 1. The present mean for TMY was higher than the most those obtained by El-Awady, 2009 (2055 kg), Khattab *et al*., 2010 (1591 kg) and El-Arian *et al*., 2012 (2070 kg) working on Egyptian buffaloes, Tonhati *et al*., 2000 (1496 kg), Tonhati *et al*., 2004 (1713 kg) on Brazilian buffaloes and Afzal *et al*., 2007 (1831 kg) with Nili Ravi buffaloes. The same trend was reported in percentages (F%, P%, Lact%, and TS%). The higher present percentages may be due to two reasons, the first including the data on Mehallet Mousa El-Gadyd herd, which is the nucleus herd and the animals in it consider improvement, the second reason may be due to limited of years covering the data (2001 to 2007).

The present average F% and P% in the Table 1 are agree with to those found in the literature, varying between (6.71 and 8.59%) for F% and (3.6 to 4.2%) for P% which reported by several researchers [i.e. Tonhati *et al*., 2000; Rosati and Van Vleck, 2002; Bhonsle *et al*., 2003; Tonhati *et al*., 2004 and Aspilcueta-Borquis *et al*., 2010 working on buffaloes in different countries. Lact% of this study (4.8%) was lower than found by Bhonsle *et al*., 2003 and Tonhati *et al*., 2004 with Murrah buffaloes being (5.03 and 5.05 respectively). In addition, the present TS% value is in agreement to that reported by (Bhonsle *et al*., 2003) in Murrah buffaloes (16.84%) and Tonhati *et al*. (2004) in Brazilian buffaloes 17.38%.

The present mean of SCC was higher than found by Cerón-Muñoz *et al*., 2002 (63,000 cell/ml) with Murrah buffaloes, but was lower than average reported by El-Awady, 2009 (183,000 cells/ml) and El-Arian *et al*., 2012 ($204.8x10^3$ cells/ml) in Egyptian buffaloes. However, SCC in milk buffaloes is lower compare with dairy cows, (El-Awady and Oudah, 2011, found that the average of SCC in Friesian cows was 453,000 cells/ml, also Fadlelmoula *et al*., 2008, on dairy cows was 317,000 cell/ml).

Economic losses

SCC did not any effect on milk yield till 600,000 cell/ml of milk and the milk yield beginning slightly decrease after 600,000 cell/ml milk till 800,000 cell/ml of milk. The higher decrease in milk yield was at level 4000,000 cell/ml of milk as shown in Table 2. The highest percentage of animal (92.11%) had the level lower than or equal 600,000 cell/ml. Increased SCC from 1000,000 cells/ml to 4000,000 cells/ml lead to increase lactationally milk losses from 97.07 kg to 125.81 kg [388.28 to 503.24 LE (EGP)] as in Table 2. Hogberg and Lind (2003) and Uppal *et al*. (1994) stated that the buffaloes possess a powerful defense mechanism against mastitis due to their tight teat sphincter and long narrow teat canal which can be expected to effectively prevent micro-organisms from invading the udder.

The pound is divided into 100 piastres (qirsh) or 1000 milliemes (malleem). The ISO 4217 code for the Egyptian pound is EGP. Locally, the abbreviation LE or L.E., which stands for livre égyptienne (French for Egyptian pound) is frequently used. E£ and £E are also much less-frequently used. The Egyptian Arabic name, ginaih, may be related to the English name guinea and L.E (EGP) = 0.156 USD.

Results in Table 3 cleared that F% and TS% were the same trend with SCC levels which were decrease with the lower levels of SCC and increase with higher levels of SCC. In contrary, P% and Lact% were increase with the lower level of SCC and decrease with the higher levels of SCC. Similarly, El-Awady, 2009 reported that the increasing SCC causes decrease of milk protein and milk lactose. Cerón-Muñoz *et al*., 2002 reported that decrease lactose percentage with SCC increased in milk buffaloes.

The present results (Tables 2 and 3) indicate that the SCC in Egyptian buffalo were low and slightly lower influence on milk and milk components, therefore the Egyptian buffaloes is one of dairy animals had resistance for the mastitis disease than the other dairy cows.

Genetic parameters

Heritability

Heritability estimates (±SE) of different studied traits are given in Table 4. Heritability estimates of TMY, F%, P%, Lact% and TS% were 0.34, 0.46, 0.35, 0.48 and 0.38, respectively. The high heritability of these traits point out to the possibility of genetic improvement through genetic selection with improves environmental conditions. The present h^2 estimate (0.34) for TMY was higher than those obtained by Sodhi *et al*., 2008 (0.20) on Murah buffaloes and El-Arian *et al*., 2012 (0.24) with Egyptian buffaloes. The present estimate of heritability for F% agrees with the estimates by Vankov, 1991 on Murrah buffalo (0.48). Aspilcueta-Borquis *et al*., 2010 estimated h^2 for F% and P% by using Baysian methodology as 0.39 and 0.26, respectively. They added that, milk yield and milk components have enough genetic variation for selection purposes.

SCC exhibited the lowest heritability estimate (0.23), although the present estimate of SCC was slightly higher than this obtained by El-Awady (2009) with Egyptian buffaloes. Low h^2 estimate for SCC (0.06±0.03) obtained by El-Arian *et al*. (2012). They added that the low heritability value for SCC indicate that this trait is affected mainly by environmental factors such as cleaning, improvement of feeding, management, milking type and number times of milking of the buffalo cow per day.

Correlations

The results of genetic and phenotypic correlations among various studied traits are presented in Table 5. From this table it could be noticed that milk production and percentages traits showed slightly unfavorable negative phenotypic and genetic correlations with SCC.

Genetic correlation between different traits studied ranged from -0.61 to 0.53. In addition, the genetic correlation between TMY and SCC was negative and low (-0.11). All genetic correlation estimates between SCC and milk constituents percentage were negative and ranged from -0.46 to -0.04. Mohamed, 2000 reported that the genetic correlation between MY, F% and P%, and genetic correlation between F% and P% in Egyptian buffaloes were -0.56, -0.82 and 0.31 respectively. Kassab *et al*., 2002 working on Egyptian buffaloes, reported that the genetic correlation between MY and both F% and P% were negative (-0.56 and -.082), respectively. Heuven *et al*. (1988) reported that change in the nature of the variation in SCC is probably responsible for the change from first to second or later parities in genetic correlation between milk traits and somatic cell count traits.

The present results indicted that selection for milk yield and milk composition will lead to decrease somatic cell counts. In this respect, Aspilcueta-Borquis *et al*., 2010 with Murah buffaloes in Brazil, reported that the genetic correlation estimates ranged from -0.13 (between P% and SCS) to 0.94 (between 305MY and 305PY). They added that, milk yield, milk components and milk somatic cell counts have enough genetic variation for selection purposes.

The present phenotypic correlations were small and ranged from (-0.04 to 0.46) between different traits studied. Mohamed, 2000 reported that the phenotypic correlation between milk yield and F% and P% low and having negative (-0.12 and -0.08), respectively. Kassab *et al*., 2002 on Egyptian buffaloes, found that the phenotypic correlation between milk yield and percentage traits (F% and P%) were negative, (-0.12 and -0.08) respectively, while the phenotypic correlation between F% and P% was positive (0.31).

Predicted breeding values (PBV's)

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Table 1. Means, standard deviations (SD) and coefficient variabilities (C.V) for TMY, F%, P%, Lact%, TS% and SCC in Egyptian buffaloes.

Items / Trait	Mean	S.D	C.V%
TMY, kg	2262	769	34
F%	6.8	1.90	28
P%	3.9	0.55	14
Lact%	4.8	0.53	11
TS%	15.5	1.86	12
SCC ($x10^3$ cells/ml)	168,232	75.66	45

Table 2. Effect of SCC levels on losses lactationally milk yield and returns (EGP*) per lactation per Egyptian buffalo cow.

SCC levels ($x10^{-3}$ cell/ml milk)	No	%	Traits	
			Milk yield losses, kg	Losses (L.E) per lactation /buffalo cow
0-50	1112	36.41	78.65±32	
51-100	628	20.56	61.50±29	
101-200	462	15.13	43.00±22	
201-400	364	11.92	29.18±20	
401-600	214	7.01	21.51±19	
601-800	123	4.03	-15.20±9	60.80
801-1000	69	2.26	-48.24±28	192.96
1001-2000	44	1.44	-97.07±61	388.28
2001-4000	38	1.24	-125.81±67	503.24

*The Egyptian pound is the current legal currency of Egypt.

Table 3. Effect of SCC levels on milk constituents losses per lactation of Egyptian buffaloes.

SCC levels (1000 cell/ml)	No	%	Traits			
			F%	P%	Lact%	TS%
0-50	1112	36.41	-.233±.08	.091±.03	.131±.03	-.205±.07
51-100	628	20.56	-.036±.02	.030±.02	.026±.02	-.012±.08
101-200	462	15.13	-.201±.12	.029±.02	.084±.03	-.069±.11
201-400	364	11.92	-.299±.08	.050±.02	.159±.03	.121±.09
401-600	214	7.01	-.079±.09	-.051±.03	-.078±.04	.013±.02
601-800	123	4.03	.121±.10	-.049±.04	-.031±.04	.088±.05
801-1000	69	2.26	.188±.16	-.043±.04	-.140±.05	.009±.05
1001-2000	44	1.44	.209±.19	-.069±.06	-.136±.07	.163±.14
2001-4000	38	1.24	.191±.16	-.074±.06	-.133±.08	.157±.11

Table 4. Estimates of (Co)variance components for TMY, F%, P%, Lact%, TS% and SCC, heritabilities, permanent effect and residual in all lactations.

Variance component	Traits					
	TMY	F%	P%	Lact%	TS%	SCC
s^2_a	245542	2.066	1.500	2.599	5.988	25007
s^2_{pe}	110598	0.871	1.024	0.995	3.610	24276
s^2_e	369961	1.581	1.721	1.854	6.151	58216
s^2_p	726101	4.518	4.245	5.448	15.749	107499
h^2_a	0.34±0.12	0.46±0.16	0.35±0.09	0.48±0.19	0.38±0.13	0.23±0.08
c^2	0.15	0.19	0.24	0.18	0.23	0.23
e^2	0.51	0.35	0.41	0.34	0.39	0.54

s^2_a = Direct additive genetic variance, s^2_{pe} = Maternal permanent environmental variance, s^2_e = Residual, σ^2_p = Phenotypic variance, h^2_a = Direct heritability, c^2 = Fraction phenotypic variance due to permanent environmental effect and e^2 = Fraction phenotypic variance due to residual effects.

Table 5. Estimates of phenotypic (above diagonal) and genetic (±SE below diagonal) correlations among different studied traits.

Traits	TMY	F%	P%	Lact%	TS%	SCC
TMY		0.005	-0.21	0.08	-0.04	-0.13
F%	-0.26±0.09		0.46	0.10	0.38	-0.15
P%	-0.43±0.11	-0.61±0.13		0.03	0.28	-0.30
Lact%	-0.14±0.05	0.07±0.01	0.17±0.02		0.44	-0.11
TS%	-0.32±0.07	0.17±0.03	0.49±0.08	0.53±0.11		-0.04
SCC	-0.11±0.03	-0.04±0.01	-0.45±0.08	-0.18±0.03	-0.46±0.12	

Table 6. Range of expected breeding values (EBV''s) through buffalo sire, cow and dams and it's percentage of accuracy's (%)for TMY, F%, P%, Lact%, TS% and SCC in Egyptian buffaloes.

Traits	Buffalo sires (EBV's)					
	Min±SE	**Max±SE**	**Range**	**Accuracy**	**Positive%**	**Negative%**
MY	-687±288	543±391	1230	66-83	54.7	45.3
F%	-0.58±1.21	0.34±1.25	0.92	57-61	62.3	37.7
P%	-0.58±0.57	0.73±0.58	1.31	87-88	55.7	44.3
Lact%	-0.56±1.03	0.45±0.80	1.01	36-69	55.7	44.3
TS%	-1.21±1.61	0.99±1.02	2.2	43-82	50.9	49.1
SCC	-146±201	371±208	517	70-72	48.1	51.9
Buffalo cows (EBV's)						
MY	-869±349	844±337	1713	76-74	44.68	55.32
F%	-1.14±1.10	0.83±1.04	1.97	69-73	53.5	46.5
P%	-0.57±1.05	0.51±1.06	1.08	46-47	58.20	41.8
Lact%	-0.63±1.03	0.43±1.04	1.06	36-37	56.62	43.37
TS%	-1.62±1.6	0.86±1.59	2.48	44-45	38.44	61.56
SCC	-216±195	630±153	846	74-85	37.14	62.86
Buffalo dams (EBV's)						
MY	-450±430	577±482	1027	37-56	53.1	46.9
F%	-0.68±1.41	0.55±1.42	1.23	38-38	56.57	43.43
P%	-1.04±0.57	0.75±0.55	1.79	88-89	52.30	49.71
Lact%	-0.98±0.84	0.66±0.75	1.64	66-74	50.29	49.71
TS%	-2.8±1.18	1.31±0.95	4.11	75-85	56.57	43.43
SCC	-125±268	407±261	532	43-83	39.73	60.27

measurement is that we may better be able to identify the genetically superior animal. This leads to more accurate selection and more genetic improvement.

The present results showed that the predicted breeding values of sires (PBV's) ranged from -687 to 543 kg for TMY, -0.58 to 1.21% for F%, -0.58 to 0.57% for P%, -0.56 to 1.03% for Lact%, -1.21 to 1.61% for TS% and -146,000 to 371,000 cell/ml for SCC (Table 6). Also, PBV's for buffaloes cows ranged between -869 and 844 kg, -1.14 and 0.83%, -0.57 and 0.51%, -0.63 and 1.03%, -1.62 and 1.6% and -21,600 and 195,000 cell/ml, for the same above traits, respectively. PBV of dams ranged from -450 to 430 kg, -0.68 to 0.55 %, -1.04 to 0.75%, -0.98 to 0.66%, -2.8 to 1.18% and -125,000 to 407,000 cell/ml for the above mentioned traits, respectively.

El-Arian *et al*., 2012 estimated the PBV's of Egyptian buffaloes from sire for TMY, FY, PY, LY, TS and SCC, being 1418kg, 178kg, 91kg, 139kg, 302kg and 9.19 x10^3 cells/ml, respectively.

Accuracy of predicted breeding values, ranged from 36 to 88%, 36 to 85%, and from 37 to 89% for sires, cows and dams, respectively, indicate that genetic improvement could be attained through any bath of sires, or buffalo cows or dams. The present accuracy estimates of predicted breeding values show that could be depended on any same of sires, buffalo cows or dams for estimated breeding values.

On the contrary, Tonhati *et al*., 2000 on Murrah buffaloes, concluded that the average breeding value of buffalo cows, dams and sires for MY was around zero, which indicted that selection in such cases was not effective. The same authors suggested that there were some difficulties on sire's selection for milk yield and that more wide range test for genetic evaluations of sires are needed. El-Awady and Oudah, 2011 on Friesian cattle concluded that if direct information on under health traits is not available, measures of SCC can be inclusion in selection criteria to improve the income from dairy cows.

CONCLUSION

The present results suggested that the SCC in Egyptian buffalo milk were low and slightly lower effect on milk and milk constituents, therefore buffaloes possess a powerful defense mechanism against mastitis. The moderate heritability of SCC and The antagonism relationship between SCC and TMY indicated that could be improved together through selection. As well as, the present results indicated that about 33% of animals were retained by 6th lactation; this is indicator that the lactating Egyptian buffaloes have a long lifetime production. Also, the animals did not affected by SCC till 600,000 cell/ml. The percentage of buffalo cows which increased than 1000,000 cell/ml to 4000,000 cell/ml were very small (4.96%) compare with the animals which had 800,000 cell/ml or less (95.04%), therefore they have resistance to mastitis. The results obtained permitted us to infer that high SCC has a negative effect on milk and lactose percentage in lactating Egyptian buffaloes, and measuring lactose can reveal a change in SCC of buffalo milk in comparison with normal. The present results suggest that selection for high milk yield will be associated with genetic improvement in milk composition and decrease SCC.

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