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**Title of Thesis: A Genetic Study on Test-Day Milk Yield and Somatic Cell Count of Egyptian Buffalo Using Random Regression**

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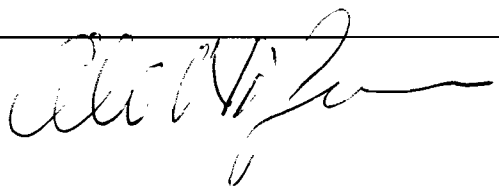
## ABSTRACT

Both fixed and random regressions were used to model test day records that are measured over the trajectory from days in milk (DIM) = 5 to 300 of the first three lactations for Egyptian buffalo. The covariance components were estimated with a single trait animal model with REML algorithm for each of daily milk yield (DMY) and $\log_{10}$ somatic cell count (LSCC) for a total of 3189 records using the random regression model (RRM). Records were taken from four buffalo experimental research herds belonging to the Animal Production Research Institute, Egypt, between 1999 and 2004. The results indicated that herd-test date (HTD) affected ($P<0.001$) both DMY and LSCC in all lactations. HTD increased the accuracy of the model when compared with herd-year-season (HYS) effect. DIM affected significant for DMY while it was non-significant for LSCC in the first three lactations. Age at calving had a significant effect on both DMY and LSCC in the second and third lactations. First lactation had a different trend for both DMY and LSCC when compared to the 2nd and 3rd lactations. Curves for LSCC along the trajectory of DIM in the first three lactations of Egyptian Buffalo shaped like an inverted milk production curves. Heritability estimates within each lactation for DMY and LSCC had wide ranges in all lactations. Heritability estimates for DMY and LSCC averaged 0.12, 0.22 and 0.20 and 0.15, 0.07 and 0.09 in the first three lactations, respectively. Estimates, in general, tended to increase toward edges of the trajectory. Additive genetic variance across the first three lactations for DMY had different trends at the beginning of the trajectory (low in the 1st, medium in the 2nd and high in the 3rd) and then gradually increased to the end of the trajectory. Permanent environmental variances for DMY were relatively low at early lactation and tended to increase toward the end of the trajectory. Residual variances for DMY were low at both edges of the 3rd lactation contradicting the 1st and 2nd lactations. All variances (genetic, permanent environmental and residual) were very high for LSCC in the 1st lactation while they were low in 2nd and 3rd lactation. This result may suggest that LSCC in the 1st lactation is not genetically the same in the rest of lactations. In general, genetic parameters for SCC were comparable to those reported for dairy cattle indicating that reduction in SCC for buffaloes could be achieved using similar practices.

***Keywords:*** genetic parameters, test day, milk yield, somatic cell count, Egyptian buffalo, random regression.



# CONTENTS


| | Page |
|---|---|
| I. INTRODUCTION | 1 |
| II. REVIEW OF LITERATURE | 6 |
| *2.1 Mammary gland immunity, mastitis incidence and somatic cell count* | 6 |
| 2.1.1 Mammary gland immune system | 6 |
| 2.1.2 Mastitis incidence and milk losses | 7 |
| 2.1.3 Origin and role of somatic cells | 11 |
| 2.1.4 Statistical characteristics of somatic cell count | 12 |
| *2.2 Non-genetic factors affecting milk somatic cell count* | 16 |
| 2.2.1 Infection status of the udder | 17 |
| 2.2.2 Age at calving and parity number | 18 |
| 2.2.3 Stage of lactation | 23 |
| 2.3.4 Season of calving | 26 |
| 2.2.5 Herd | 29 |
| 2.2.6 Day-to-day variation and diurnal variation | 29 |
| *2.3 The use of test day records in genetic evaluation of dairy cattle* | 30 |
| 2.3.1 Fitting the lactation curve | 33 |
| *2.4 Modeling of repeated measurements* | 37 |
| 2.4.1 Repeatability model | 37 |
| 2.4.2 Multivariate (MV) technique | 38 |
| 2.4.3 Random Regression (RR) technique | 38 |
| *2.5 Genetic parameters for somatic cell count* | 40 |

2.5.1 Estimation of heritability for SCC 41

2.5.2 Estimation of repeatability for SCC 47

2.5.3 Genetic, phenotypic and permanent environmental correlations for SCC 50

III. MATERIAL AND METHODS 60

3.1 Data 60

3.2 Animals and Management 63

*3.3 Statistical Analysis* 63

3.3.1 Fixed effect model 63

3.3.2 Genetic parameters model 64

3.3.3 Estimation of genetic parameters 66

IV. RESULTS AND DISCUSSION 68

4.1 Means of daily milk yield (DMY), somatic cell count (SCC) and $\log_{10}$ somatic cell count (LSCC) in the first three lactations 68

*4.2 Non-genetic effects for DMY, Kg and LSCC in the first three lactations* 69

4.2.1 Herd-test date 69

4.2.2 Days in milk (DIM) 71

4.2.3 Age at calving 71

*4.3 Covariance structure and genetic parameters for DMY and LSCC* 76

4.3.1 Additive genetic and permanent environmental covariances for DMY 76

4.3.2 Additive genetic and permanent environmental covariances for LSCC 81

4.3.3 Residual and phenotypic variances of DMY 84

4.3.4 Residual and phenotypic variances of LSCC 87

4.3.5 Heritability for DMY 89

4.3.6 Heritability for LSCC 91

4.3.7 Genetic and permanent environmental correlations for DMY 93

4.3.8 Genetic and permanent environmental correlations for LSCC 95

4.3.9 Phenotypic correlations for DMY 99

4.3.10 Phenotypic correlations for LSCC 99

V. CONCLUSION 102

VI. SUMMARY 104

VII. REFERENCES 108

ARABIC SUMMARY

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **CM** | Clinical mastitis |
| **DF-REML** | Derivative-free restricted maximum likelihood |
| **DIM** | Days in milk |
| **DMY** | Daily milk yield |
| $\mathbf{h^2}$ | Heritability |
| **HTD** | Herd–test date |
| **HYS** | Herd-year-season |
| **LSCC** | $Log_{10}$ somatic cell count |
| **MV** | Multivariate |
| $\mathbf{r}_g$ | Genetic correlation |
| $\mathbf{r}_p$ | Phenotyic correlation |
| $\mathbf{r}_{pe}$ | Permanent environmental correlation |
| **RRM** | Random regression model |
| **SCC** | Somatic cell count |
| **SCS** | Somatic cell score |
| **SD** | Standard deviation |
| **SE** | Standard error |
| $t$ | Repeatability |
| **TD** | Test day |
| **TDM** | Test day model |