STUDIES ON PRODUCTIVITY IN RUMINANTS UNDER THE SYSTEMS OF PRIVATE FARMS

BY

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B.Sc. Agric. Sc. (Animal Production), Ain Shams University, 1999

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ABSTRACT

Neivein Gamal Mohammad Fahmy. Studies on productivity in ruminants under the systems of private farms , Unpublished Master of Science thesis, Ain Shams University, Faculty of Agriculture, Department of Animal Production, 2005.

The objective of this study was to estimate genetic parameters of test-day milk yields (TDMY's) in the first three parities using random regression technique. Data used in the study were collected from the Assiout private farm in Assiout Governorate in the south of Egypt. In total, a data set of 8473 test-day milk yield (TDMY) records for the first three lactations (3875, 2993 and 1605, respectively)of 414 cows daughters of more than 66 sires and 197 dams was available from 1998 till 2004. Data were classified according to the month of calving into four seasons, winter, spring, summer and autumn. The statistical model included year-season, the linear and quadratic orders of age, fixed regression, a random additive genetic effect for each animal, a random permanent environmental effect for each cow and a random residual effect. The Incomplete Gamma Function (IGF) was chosen to describe the shape of the lactation curve. This function was fitted for each lactation for each cow. DFREML software was used to estimate the components of (co)variance of TDMY in a Random Regression Model (RRM). Estimates of the additive genetic correlations between TDMYs ranged form -0.978 to 0.993, -0.730 to 0.992 and -0.086 to 0.991 for the three parities, respectively. Estimates of heritability of TDMY increased from 0.030 for DIM 65 to 0.142 for DIM 185 then decreased to 0.035 for DIM 275 in the first parity. Heritability increased from 0.154 for DIM 65 to 0.215 for DIM 155 then decreased to 0.180 for DIM 215 in the second parity. Heritability decreased from 0.486

for DIM 5 to 0.409 for DIM 125 then increased to 0.696 for DIM 305 in the third parity.

Key words: Random regression model, Incomplete Gamma Function, Genetic parameters, Test-day milk yield, Lactation curve, Holstein

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List of Abbreviations

CF	Covariance function
DFREML	Derivative free restricted maximum likelihood
DIM	Day in milk
IGF	Incomplete gamma function
MV	Multivariate
MY	Milk yield
RR	Random regression
TD	Test day
TDM	Test day model
TDMY	Test day milk yield

1. Introduction

Many factors affect milk production of the cow from one test-day (TD) to the next. It is difficult to model for whole 305-day yields taking into account all such factors (Jamrozik et al., 1996). A test-day model for genetic evaluation can account for these factors such as, day of the year (including weather conditions), management groups within a herd, and, for each cow, day in milk (DIM), pregnancy status and number of times of milking daily (Meyer et al., 1989 and Ptak & Schaeffer, 1993). Test-day model (TDM) can also account for the effect of test date, number of records, interval between records and order of test-day records (Reents and Dopp, 1996). Moreover, models using longitudinal measurements would include information about the pattern of a lactation curve for a cow (Schaeffer and Dekkers, 1994).

Many models have been described for the analysis of test-day yields by several studies (Wood, 1967, Ali and Schaeffer, 1987 and Wilmink, 1987). Random regression model (RRM) has become a popular choice for the analysis of longitudinal data or repeated records. This analysis is challenging because it requires numerous parameters ((co)variances between random regression (RR) coefficients) and measurement of error variances (Meyer, 2002), in addition to the (co)variance structure of the test-day yields (Liu et al., 2000).

The objective of this study was to estimate genetic parameters of test day milk yields (TDM's) in the first three lactations in single trait model with a small data set from a private Holstein dairy farm using random regression with the covariance function technique.

2. Review of Literature

Commercial herds in Egypt usually use 305-day MY or total milk yield in their herd evaluation. This requires that cows stay at least one full lactation. Moreover the 305-day model does not account for the non genetic factors affecting the (co)variance structure along the trajectory. In an effort to account for these factors **Ptak and Schaeffer (1993)** suggested a repeatability model. The repeatability model is simple, but assumes that the variance is constant along the trajectory. The multivariate (MV) model is used to analyze the longitudinal traits, where it assumes subsequent records as different traits. The main disadvantage of MV model is the large computational demands it requires.

2.1 Estimates of Heritability Using 305-Day Milk Yield

Table 1 shows estimates of heritability using 305-day MY in Egypt.

Table 1. Some reviewed estimates of heritability (h^2) $\pm$ SE of milk yield using 305-day milk yield in Holstein cows.

No	P	h^2	Reference
767	1	0.43$\pm$0.12	**Khattab and Sultan (1990)**
10314	1	0.25$\pm$0.042	**Ashmawy and Khalil (1990)**
4200	na	0.25	**Kassab and Salem (1999)**
460	na	0.13$\pm$0.09	**El-Barbary *et al.* (1999)**
1391	1-3	0.09	**Abou-Bakr *et al.* (2000)**
2245	na	0.05	**Abdel-Salam *et al.* (2001)**
9622	1-3	0.14	**Abdelharith *et al.* (2002)**
1163	1	0.06$\pm$0.06	**Nigm *et al.* (2003)**
2096	1-6	0.32	**El-Arian *et al.* (2003)**
1163	1	0.08$\pm$0.08	**Abou-Bakr (2003)**
970	1	0.09$\pm$0.7	**Zahed *et al.* (2003)**
5642	na	0.54	**Abdel-Gelil *et al.* (2004)**

No : number of record; P : parity ; na : not available