

Environmental effects on lactation curves included in a test-day model genetic evaluation



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Context

Genetic evaluations based on test-day (TD) models present numerous advantages in comparison with 305-day lactation model, in particular it enables an accurate modeling of lactation curves.

A large number of factors such as parity, calving year, calving month and age, pregnancy are known to affect the cow's milk production.

Materials and Methods

- Montbéliarde data (Milk, Fat, Protein yields) with a subset of 2.5 million TDs.
- Regression splines to model lactation curves. The overall fixed part of an animal's lactation curve is the sum of elementary curves.
- Comparison of models based on analyses of residuals (SAS GLM) and graphics.
- Final check on a 21 million TD data set.

Results

A - Impact of year effect on the shape of lactation curves

- Analysis of residuals obtained with models I and II showed similar fit (fig. A1).
- Curves by year x parity x class of effect (for instance calving age – fig. A2) presented similar profiles for different calving years.

⇒ **Shape of lactation curves does not depend on year**

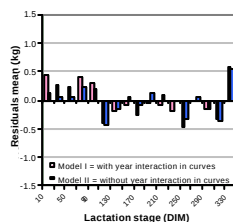


Figure A1. Residuals for Models I and II (with/without year for the fixed effects curves) analysed by class of DIM

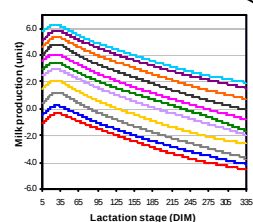


Figure A2. Effects of year on test-day Milk production for 2nd lactation Montbéliarde cows calving at 43-45 months

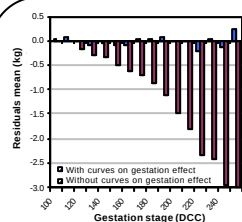


Figure B1. Residuals for Model II and Model II without curves on gestation effect analysed by class of days carried calf (DCC)

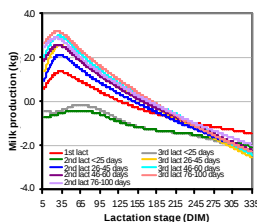


Figure B2. Effects of length of dry period on Montbéliarde test-day Milk production

B - Choice of environmental effects to model the shape of lactation curves

- Removal of any of the fixed effects curves in Model II (e.g., gestation – fig. B1) led to larger residuals.
- Curves with model II showed the impact of each class on the shape of lactation curves (e.g., fig. B2 illustrates a large penalization of production for dry periods shorter or equal to 25 days).

⇒ **The 4 factors in model II affect lactation curves**

Conclusion

- The shape of the lactation curves does not change over years. Yearly environmental trends can be modelled as a constant over the whole lactation.
- Environmental factors such as calving age and month, length of dry period and gestation have an impact not only on the level of production, but also on the shape of lactation curves.

In practice, the estimation of environmental effects affecting daily yields and shape of lactations offers the possibility to forecast production and to implement better management tools.

Acknowledgments : This study was partly funded by the French Ministry of Agriculture (UTILEG). It was realized within the Framework of the cattle genetic evaluation unit (UMT)