

EFFECT OF LACTATION MONTH ON THE FATTY ACID PROFILE AND SIZE DISTRIBUTION OF MILK FAT GLOBULES OF MILK FROM SECOND-PARITY LACAUNE EWES



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INTRODUCTION

The stage of lactation significantly influences the fatty acid (FA) profile and size distribution of milk fat globules (MFG), which has an impact on the technological and nutritional quality features of high-value-added milk products. However, the influence of lactation stage on FA profile and MFG size varies. This study aims to investigate the effect of lactation month on the FA profile, MFG size, and their relationships in Lacaune ewes' milk.

MATERIAL AND METHODS

Second parity Lacaune ewes (n=51) milk samples were collected monthly, six times during lactation, starting from 30 days postpartum. The FA were quantified using a gas chromatograph (Agilent 6890A, Agilent Technologies Inc.) equipped with autosampler and 100 m × 0.25 mm CP-Sil 88 capillary column. MFG size distribution was determined with a laser diffraction analyzer (Malvern Mastersizer 3000, Malvern Instruments Ltd.).

RESULTS

Fatty Acid profile

- ✓ The concentration of short chain fatty acids decreased within lactation, while the concentration of medium-chain fatty acids and conjugated linoleic acid (CLA) increased (Figs. 1, 2).
- ✓ The highest desaturase activity (DI14, DI16, and DI18) was observed in the milk collected during the seventh month, likely contributing to a significantly higher proportion of C14:1 cis-5, C16:1 cis-7, and C18:1 cis-9 FAs.
- ✓ The atherogenic index (AI) level is lowest in the second month of lactation (lower AI, lower risk of atherosclerosis and cardiovascular disease). However, the correlation with the month of lactation is very weak (r=0.173).

Fat Globule Size

- ✓ The size distribution of MFG the early months of lactation was significantly different (P<0.001) from the size distribution the later months of lactation (Fig. 2).
- ✓ The effect of lactation was significant (P<0.001) both in MFG D[4,3] (volume-weighted mean diameter) and Dv50 (median diameter) (Fig. 3).
- ✓ The MFG D[4,3] varied the most in the samples collected during the second and sixth lactation months (Fig. 3).

Correlations Between FA Content and MFG Size

- ✓ The smaller fat globules, which occur in the sixth and seventh months of lactation, contains more medium chain FA.
- ✓ A weak negative correlation (r = -0.29) between CLA and Dv50 suggests that smaller MFG contains more CLA.

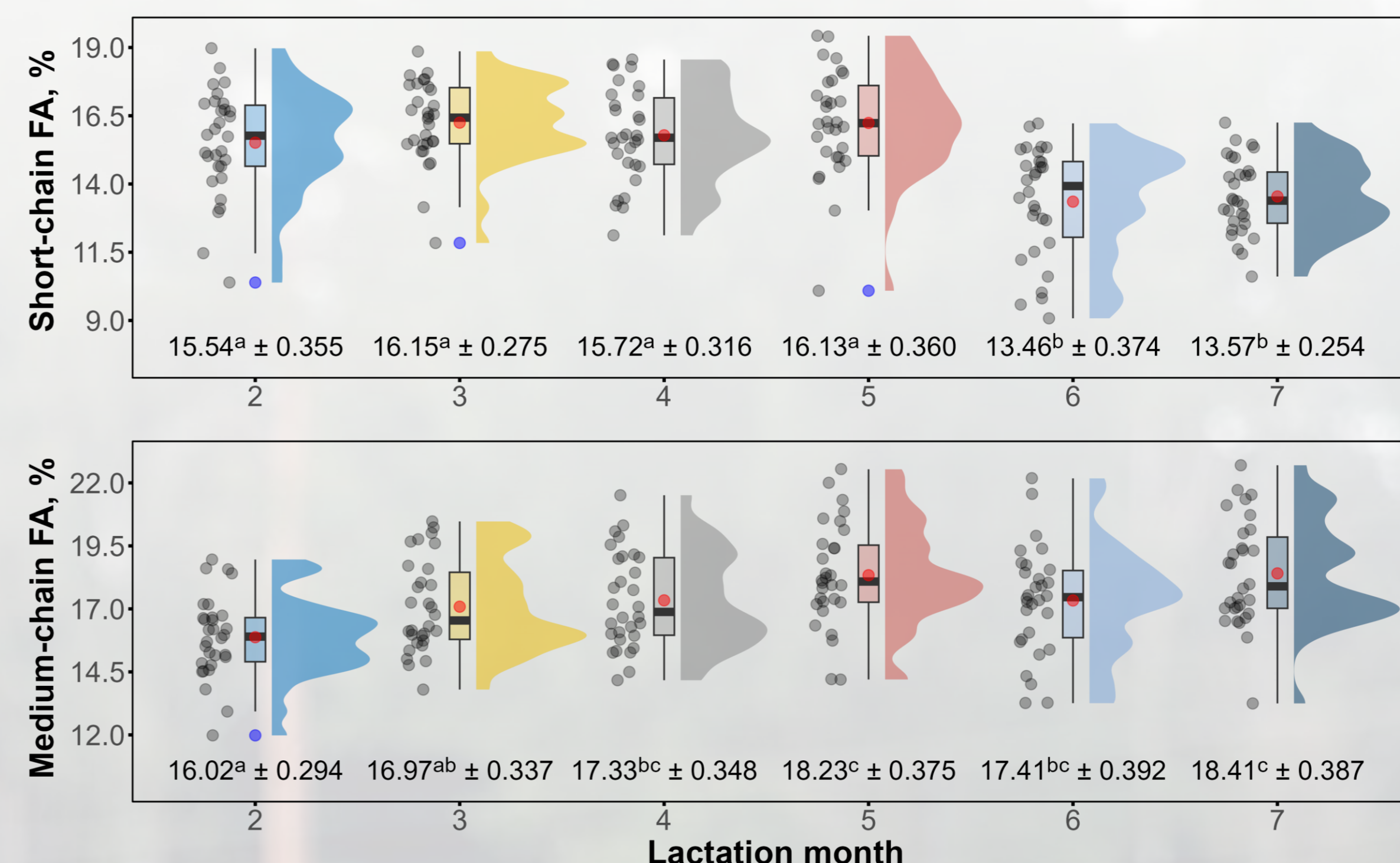


Fig. 1. The least square means ± SE of short- and medium-chain FA of Lacaune ewe's milk (grey dots – observed values, red dot – mean value, blue dots – extreme values, horizontal thick line – median, right side – density plot; different lowercase letters – P<0.05).

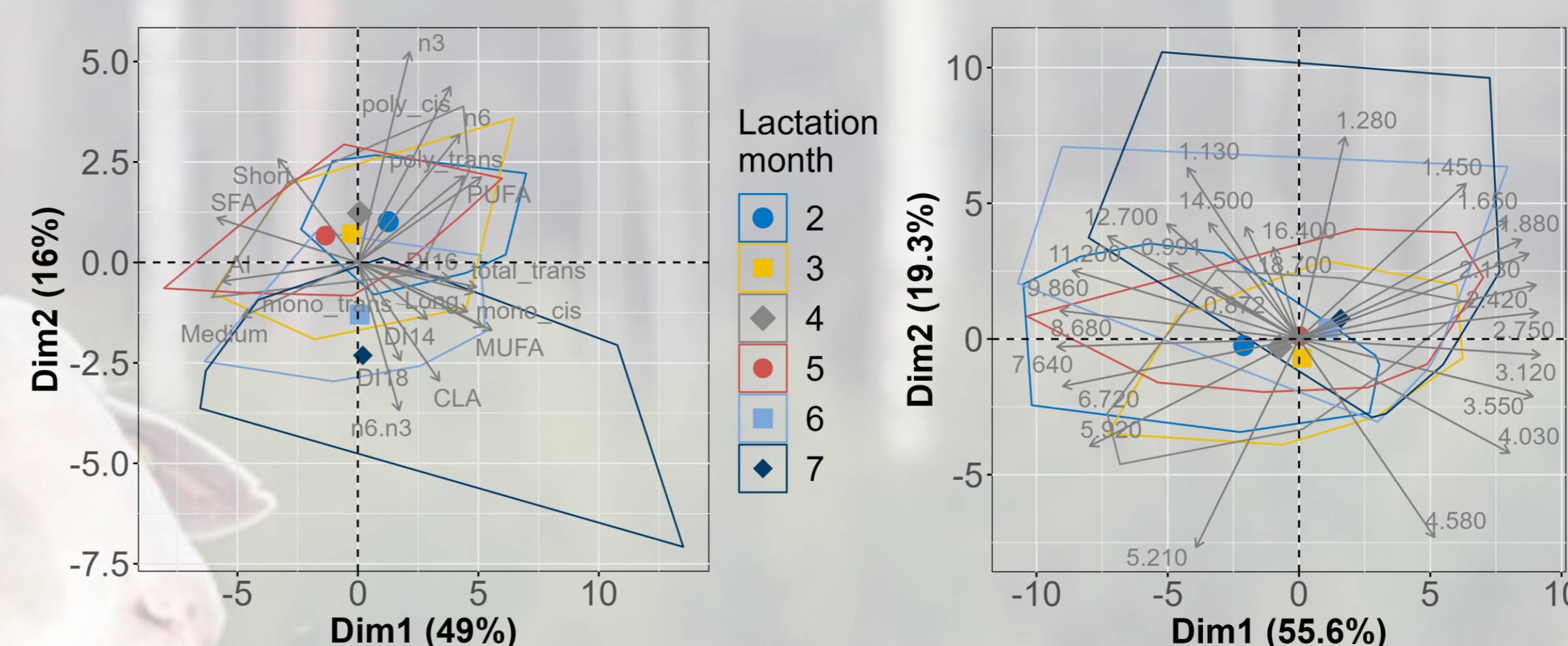


Fig. 2. PCA analysis of FA and MFG size (µm) in Lacaune ewes' milk.

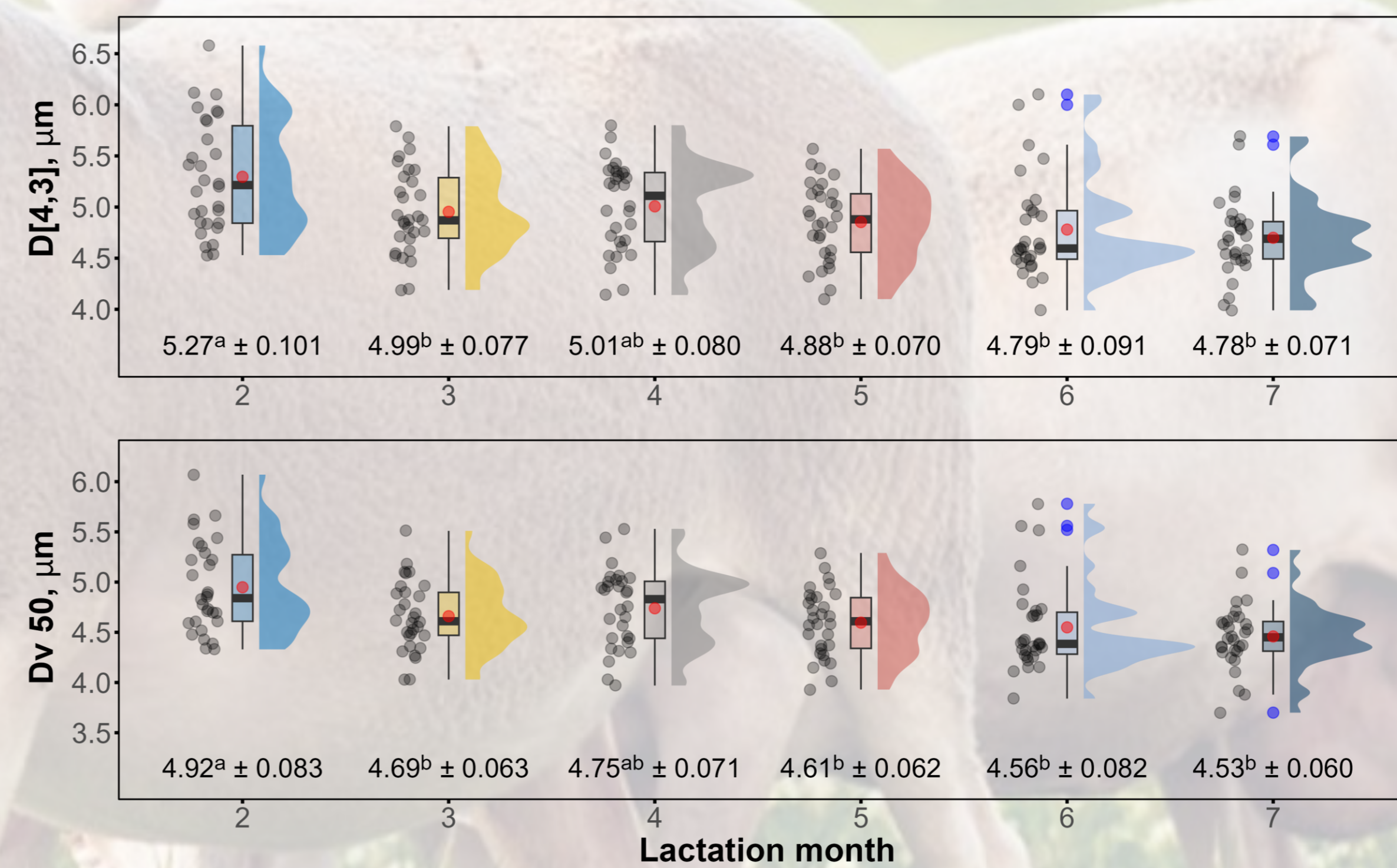


Fig. 3. Least square means ± SE of MFG D[4,3] and Dv50 in Lacaune ewe's milk (grey dots – observed values, red dot – mean value, blue dots – extreme values, horizontal thick line – median, right side – density plot; different lowercase letters – P<0.05).

CONCLUSIONS

The results showed that the sixth and seventh lactation months, FA and MFG differ significantly from previous months. Obtained knowledge about patterns and trends is applicable in optimization (for example selection of milk for certain products according to lactation month) of the production of high-value-added ewe milk products.