

Influence of the season on the level of biogenic amines in Vacherin Fribourgeois PDO

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Background

Cheese made from raw milk enjoys great popularity. Within the framework of the Swiss Center of Excellence for Raw Milk Products trials with Vacherin Fribourgeois PDO were carried out during a whole year. Vacherin Fribourgeois PDO was produced monthly from raw and thermized milk at the Grangeneuve cheese dairy. Chemical and rheological analyses were performed and evaluated in the mature cheeses (120 days old). The analysis focused on the differences between the cheeses made from raw milk and the cheeses made from thermized milk, as well as on the differences between the seasons.

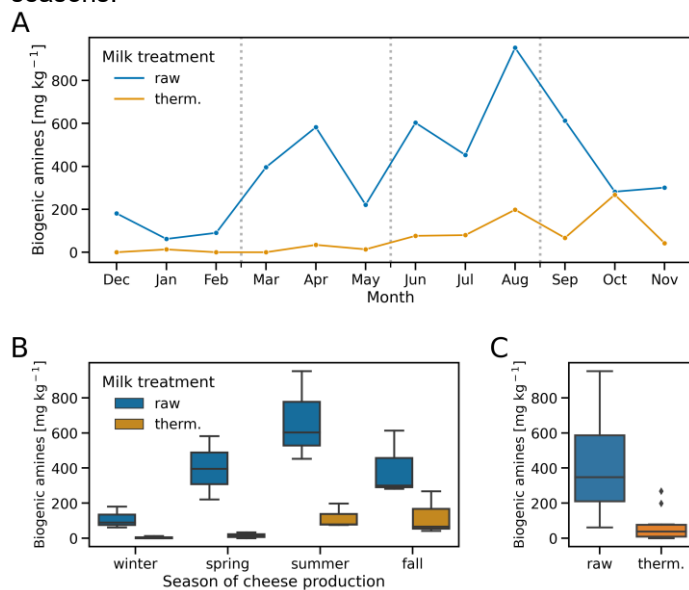


Figure 1: Biogenic amine concentration for 24 Vacherin Fribourgeois PDO made from raw (n=12) and thermized (n=12) milk, respectively. **A)** Progression during the year, **B)** grouped by season and **C)** grouped by milk treatment.

Results

- The concentration of biogenic amines in Vacherin Fribourgeois PDO made from raw and thermized cow's milk was significantly different between the two groups (t-test, $p=0.001$).
- The differences in concentration of biogenic amines between the four seasons were not statistically significant for the entire dataset and the cheeses made from thermized milk as determined by One-way ANOVA, however for the cheeses made with raw milk we found a significant difference between cheeses manufactured in winter and in summer (One-way ANOVA & Tukey HSD, $p=0.025$).
- The biogenic amine detected most frequently and in the largest concentrations was tyramine.
- Levels of FHL and enterococci have shown a rather strong correlation with the concentration of biogenic amines.

Methods

Biogenic amines in cheese were analyzed as described by Ascone et al. (2017) using a UPLC system (UltiMate 3000 RS) equipped with a C18 column (Accucore C18: 2.6 mm, 150 × 4.6 mm). For the microbiological analysis, 10 g of cheese core samples were homogenized in 90 mL of PBS using a Stomacher, then diluted 10-fold in PBS for the viable counts of different microbial groups on selective agar media. The average air temperature data per day (6:00-18:00 UTC) from the Grangeneuve monitoring station were obtained from MeteoSwiss.

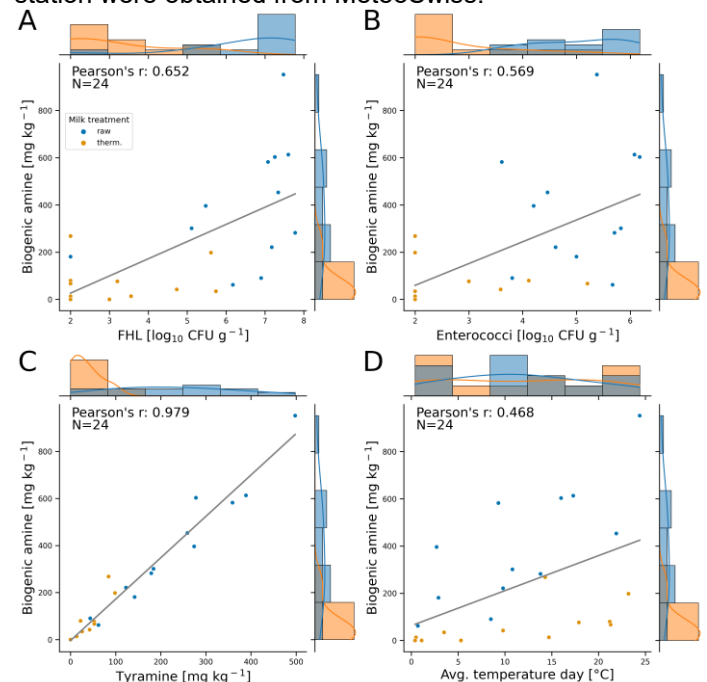


Figure 2: Scatter plots for **A)** facultative heterofermentative lactic acid bacteria (FHL), **B)** enterococci, **C)** tyramine and **D)** average air temperature on the day of cheese production on the x-axis and biogenic amine concentration on the y-axis. Pearson correlation coefficient (r) and number of samples (N) are shown in the upper right of the plots.

Summary

The season and presumably the temperature on the day of production seem to have an influence on the content of biogenic amines in Vacherin Fribourgeois AOP made from raw milk. Tyramine was the biogenic amine with the largest detected fraction in the samples studied. Bacterial groups associated with tyramine production in cheese (enterococci and FHL) showed a rather high correlation with biogenic amine content. The observed seasonal effects on biogenic amine levels are similar to those reported in Fiore Sardo; a typical artisanal Sardinian cheese made from raw sheep's milk (Manca et al. 2023).

References

- 1) Ascone, et al., (2017). <https://doi.org/10.1016/j.idairyj.2016.11.012>
- 2) Manca, et al., (2023). <https://doi.org/10.1016/j.foodcont.2022.109486>