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Assessment of the Variability in the Microbiological Quality of Four Batches of Raw Milk Cheese Produced from Milk Supplied by Two Different Farms in Italy

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In this study, we investigated the correlation between the microbiological parameters of raw milk produced by two different farms in Northern Italy and those of the corresponding raw milk cheeses. Four batches of cheese were analyzed throughout the production process, up to the end of the seasoning period. The microbiological parameters examined included Total Mesophilic Bacteria (TBC), Enterobacteria (ENT), and Lactic Acid Bacteria (LAB). Additionally, pH and water activity (aw) were measured.
The distribution and homoscedasticity of these parameters were assessed across the four tested batches at different time points (i.e., 7, 15, and 30 days of seasoning). Statistical differences between the microbiological and physicochemical parameters of the cheese batches and raw milk were evaluated using ANOVA, robust ANOVA, and the Kruskal-Wallis test based on the above-mentioned assumptions.
Furthermore, the evolution of the microbial population in each batch was analyzed using paired sample time-series analysis, employing ANOVA for repeated measures, the Conover test, and the Durbin test for unpaired block design. Notably, we identified statistically significant differences ($p \leq 0.05$) in TBC, ENT, LAB, pH, and aw among the four batches throughout the entire production process, from raw milk to cheese aged for 30 days. The only exception was the pH of cheese seasoned for 15 days, which did not reach statistical significance ($p = 0.0659$).
Additionally, post-hoc tests, including Tukey's HSD, Tamhane's T2 test, Dunn's test, pairwise t-tests, the Conover all-pairs test, and the Durbin all-pairs test, were applied to determine where significant variability existed among the four analyzed batches.
Finally, correlations among the variables collected at each follow-up were analyzed using the Spearman approach to provide a comprehensive time-series overview.

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