

Raw milk composition associated with texture profile attributes of low-moisture mozzarella cheese in Taiwan

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To enhance the added value of domestically produced raw milk, Taiwan's dairy sector is undergoing a value-chain transition from commodity milk sales toward higher-value dairy processing. Variability in low-moisture mozzarella cheese texture undermines product consistency, and differences in raw milk composition may contribute to this variation.

This study examined associations between raw milk composition and texture profile analysis (TPA) attributes across seven production batches. Raw milk was characterized using routinely measured components, including fat, protein, lactose, somatic cell count (SCC), acetone, and fatty-acid profiles. Mozzarella texture was evaluated by TPA (hardness, adhesiveness, springiness, cohesiveness, chewiness, resilience). Pearson correlations were computed at the batch level ($n = 7$), and multivariate structure among milk indicators was summarized using principal component analysis (PCA).

Fatty acids were associated with texture: oleic acid (C18:1) was positively associated with cohesiveness ($r = 0.84$, $p < 0.05$) and resilience ($r = 0.87$, $p < 0.05$). Preformed fatty acids were positively associated with chewiness ($r = 0.84$, $p < 0.05$) and hardness ($r = 0.79$, $p < 0.05$), and long-chain fatty acids (LCFA) were positively associated with cohesiveness ($r = 0.78$, $p < 0.05$). In contrast, protein/casein-related indices were negatively associated with springiness (casein: $r = -0.83$, $p < 0.05$; true protein: $r = -0.81$, $p < 0.05$; crude protein: $r = -0.76$, $p < 0.05$). PCA explained 70.8% of the variance in milk indicators using two components (PC1 44.4%, PC2 26.4%), broadly separating a fatty-acid/solids axis from a protein/casein axis. These preliminary findings suggest that routinely available fatty-acid and protein/casein indicators may help anticipate low-moisture mozzarella texture outcomes. Future studies with larger datasets are needed to validate these associations and develop robust predictive models for low-moisture mozzarella-specific milk grading.