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The Influence of the Hygienic Quality of Raw Milk on Its Stability During Cold Storage

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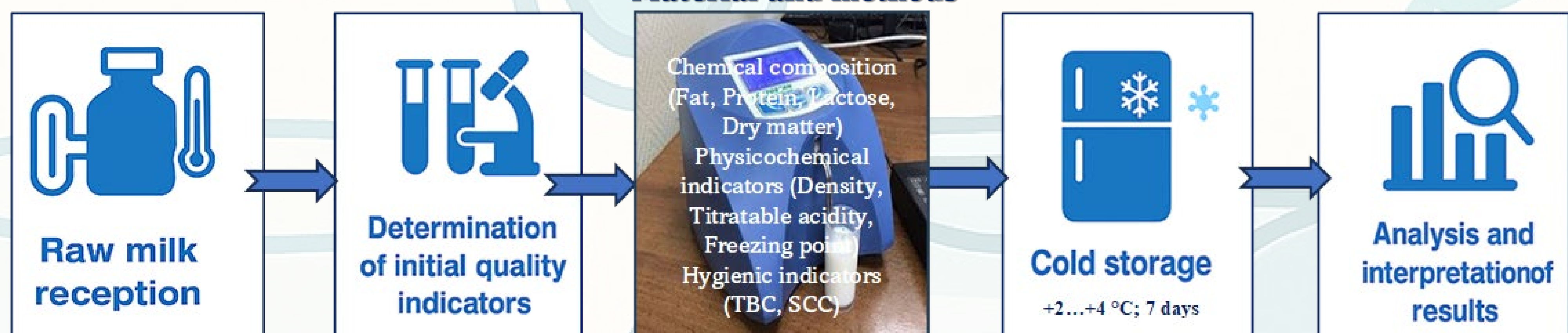
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Abstract: Raw cow's milk is a complete food, but its hygienic quality can be affected by microbial contamination during production, handling, and storage, influencing stability and safety. This study (January–June 2025) evaluated raw milk from the ULST farm, assessing chemical composition (protein, fat, lactose, minerals), total bacterial count (TBC), and somatic cell count (SCC) in relation to legal standards. Milk components remained within normal ranges, with high lactose (>4.7%) supporting good technological potential. Hygienic parameters (TBC < 30,000 cfu/mL, SCC < 200,000 cells/mL) indicated excellent hygiene and udder health. Initial pH (~6.58) and acidity (15.8–18.1°T) confirmed freshness, with stability maintained up to 72–96 h at 4°C. Samples with higher TBC and SCC showed faster acidification, demonstrating that initial hygienic quality strongly influences milk stability during cold storage.

• Introduction

Raw milk is a biologically active product whose quality and shelf life are closely linked to its hygienic status at collection. Microbial contamination, elevated somatic cell counts, and endogenous enzymatic activity can compromise its physicochemical stability and microbiological safety during cold storage. Continuous monitoring of these parameters is therefore essential to maintain milk freshness, technological suitability, and the overall quality of dairy products derived from raw milk.

• Material and methods



• Results and discussions

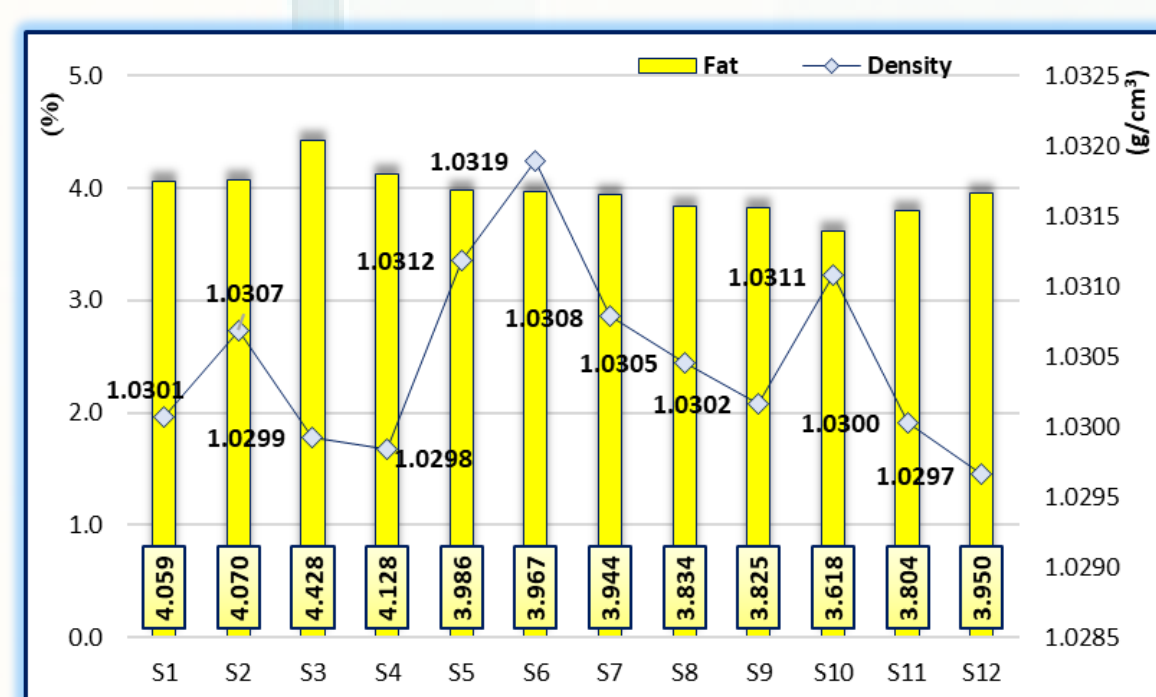


Figure 1. Dynamics of fat content and density in raw milk

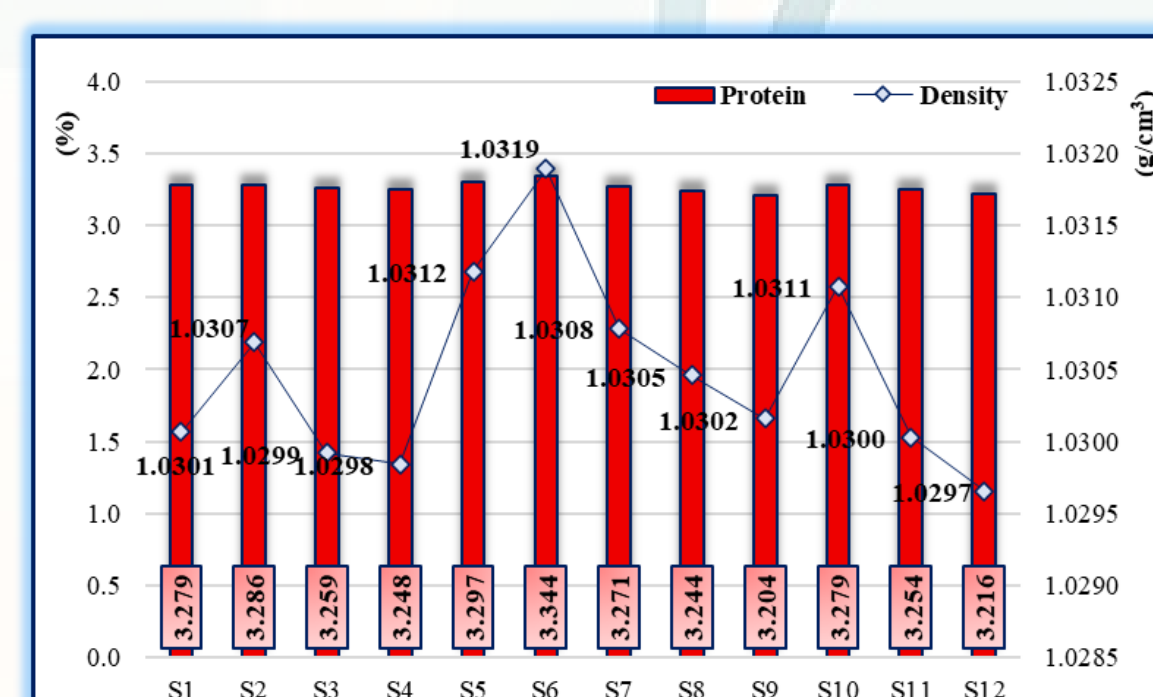


Figure 2. Dynamics of protein content and density in raw milk

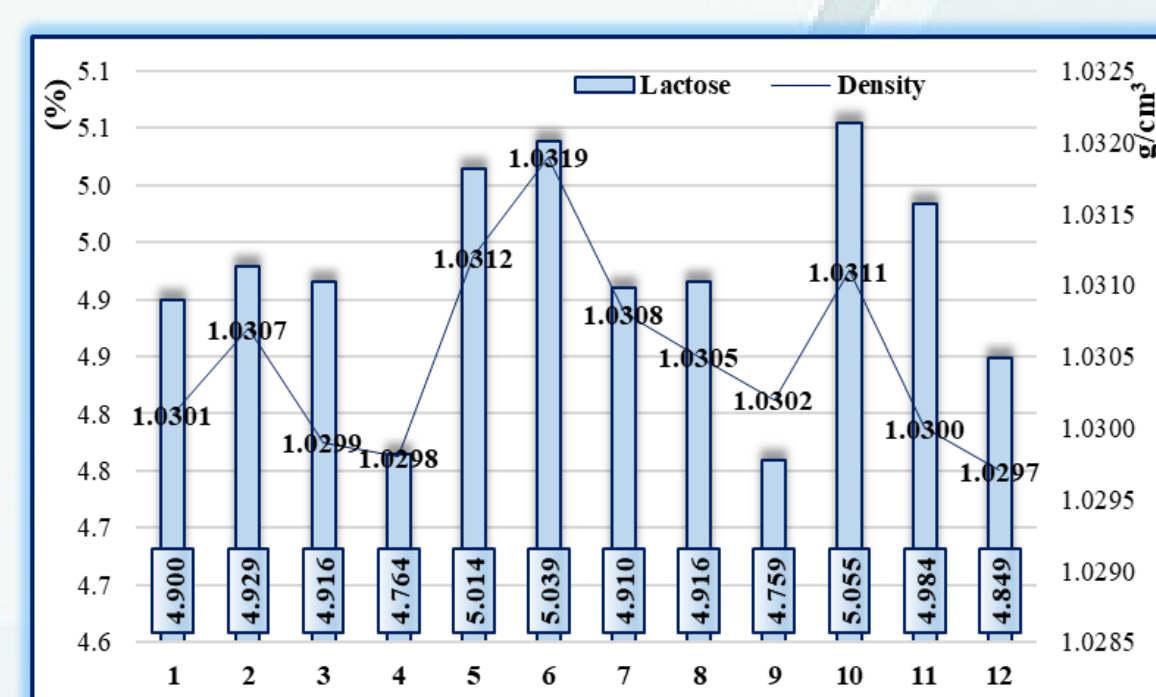


Figure 3. Dynamics of lactose content and density in raw milk

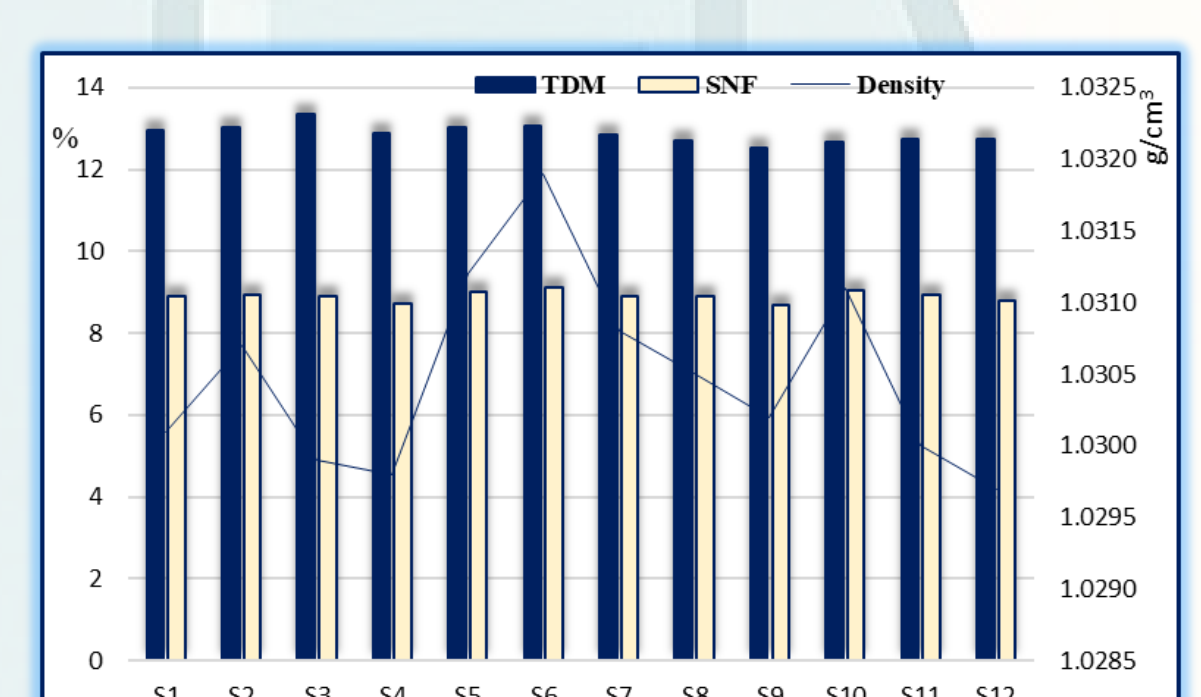


Figure 4. Dynamics of total and non-fat dry matter (TDM and SNF) and density in raw milk

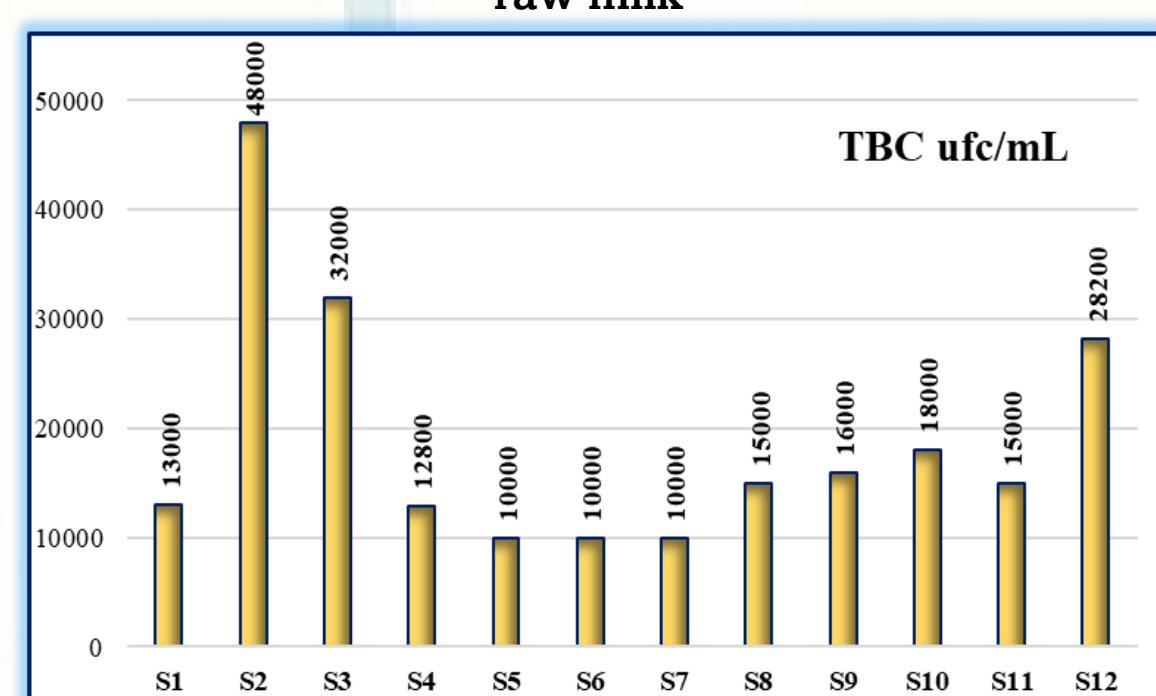


Figure 5. Dynamics of the total bacterial count (TBC)

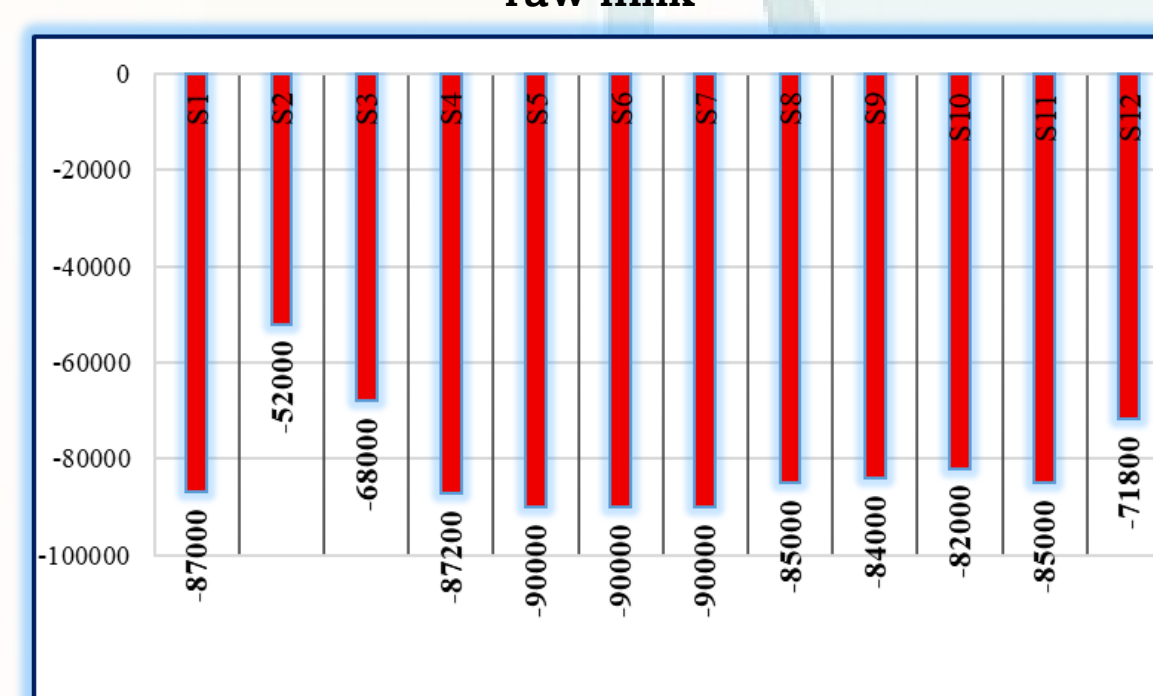


Figure 6. Deviations from the maximum permissible limit for TBC (100000 ufc/mL)

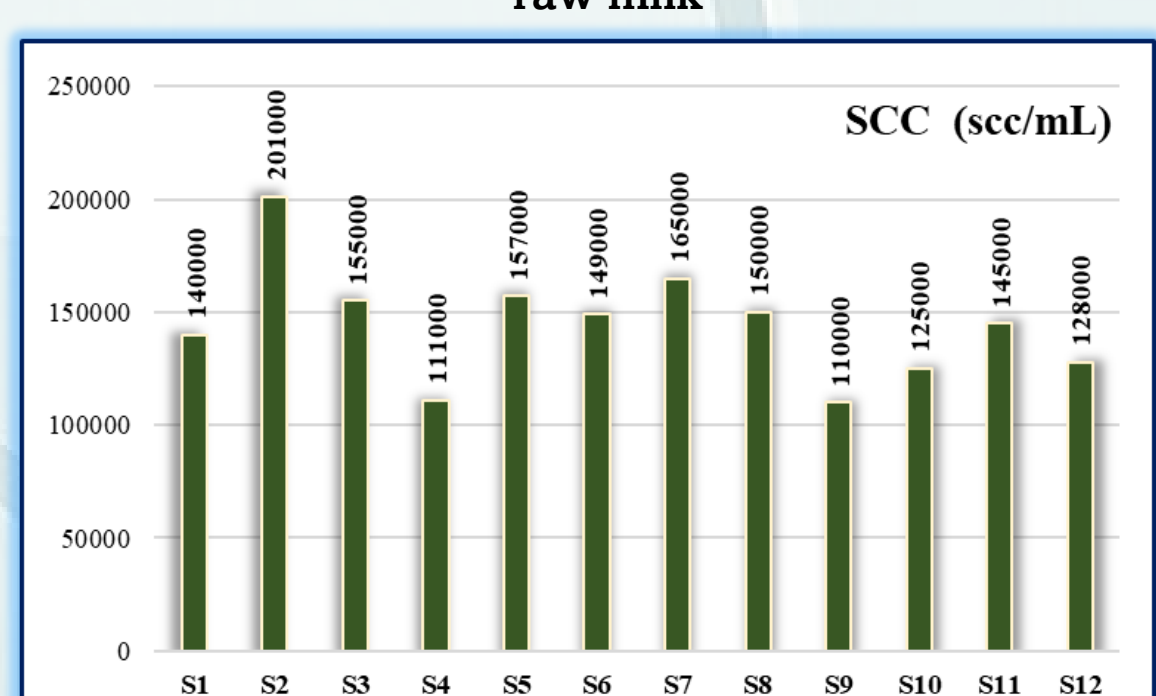


Figure 7. Dynamics of the somatic cell count (SCC)

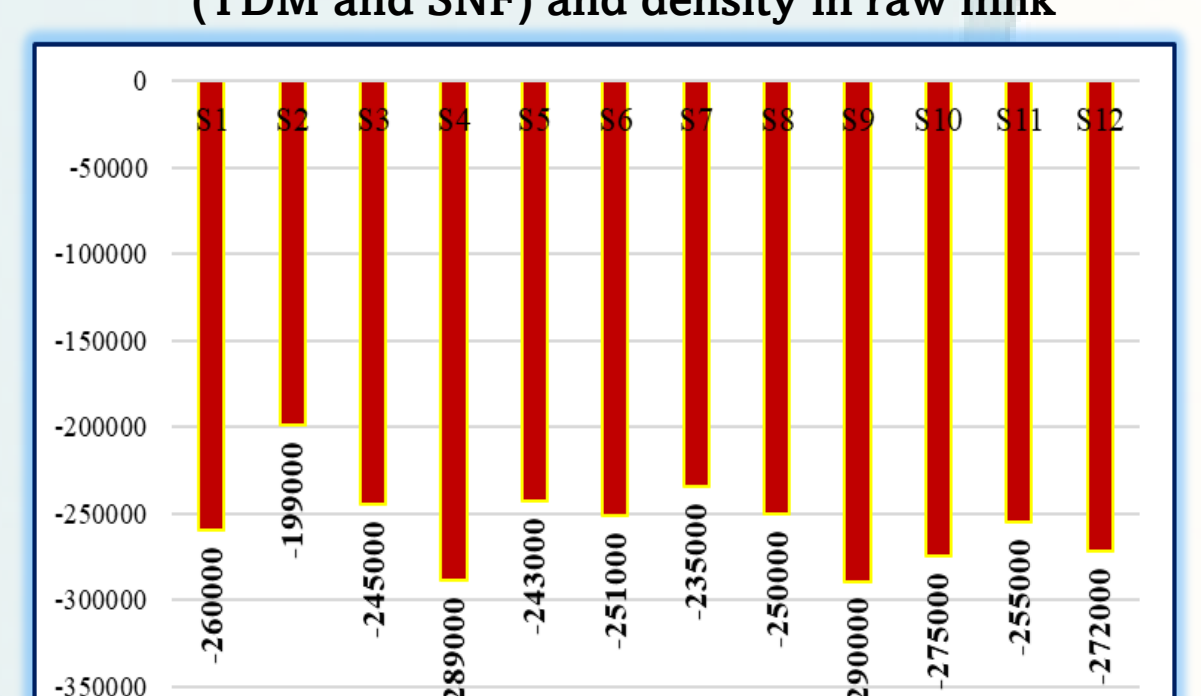


Figure 8. Deviations from the maximum permissible limit for SCC (400000 cells/mL)

Table 1. Dynamics of pH in raw milk during cold storage (7 days, +2...+4°C)

Sample	pH _i	pH ₂₄	pH ₄₈	pH ₇₂	pH ₉₆	pH ₁₂₀	pH ₁₄₄	pH ₁₆₈
S1	6.584	6.580	6.574	6.555	6.545	6.535	6.525	6.515
S2	6.584	6.570	6.555	6.540	6.525	6.510	6.455	6.410
S3	6.580	6.566	6.552	6.538	6.524	6.500	6.436	6.402
S4	6.589	6.580	6.572	6.563	6.555	6.546	6.538	6.529
S5	6.581	6.573	6.565	6.557	6.549	6.541	6.533	6.525
S6	6.585	6.576	6.568	6.560	6.552	6.544	6.536	6.528
S7	6.587	6.578	6.570	6.562	6.554	6.546	6.538	6.530
S8	6.574	6.569	6.562	6.544	6.534	6.524	6.514	6.504
S9	6.584	6.582	6.576	6.552	6.541	6.531	6.520	6.510
S10	6.583	6.580	6.572	6.551	6.540	6.530	6.520	6.510
S11	6.579	6.577	6.568	6.557	6.537	6.527	6.517	6.507
S12	6.581	6.567	6.553	6.539	6.525	6.495	6.467	6.415

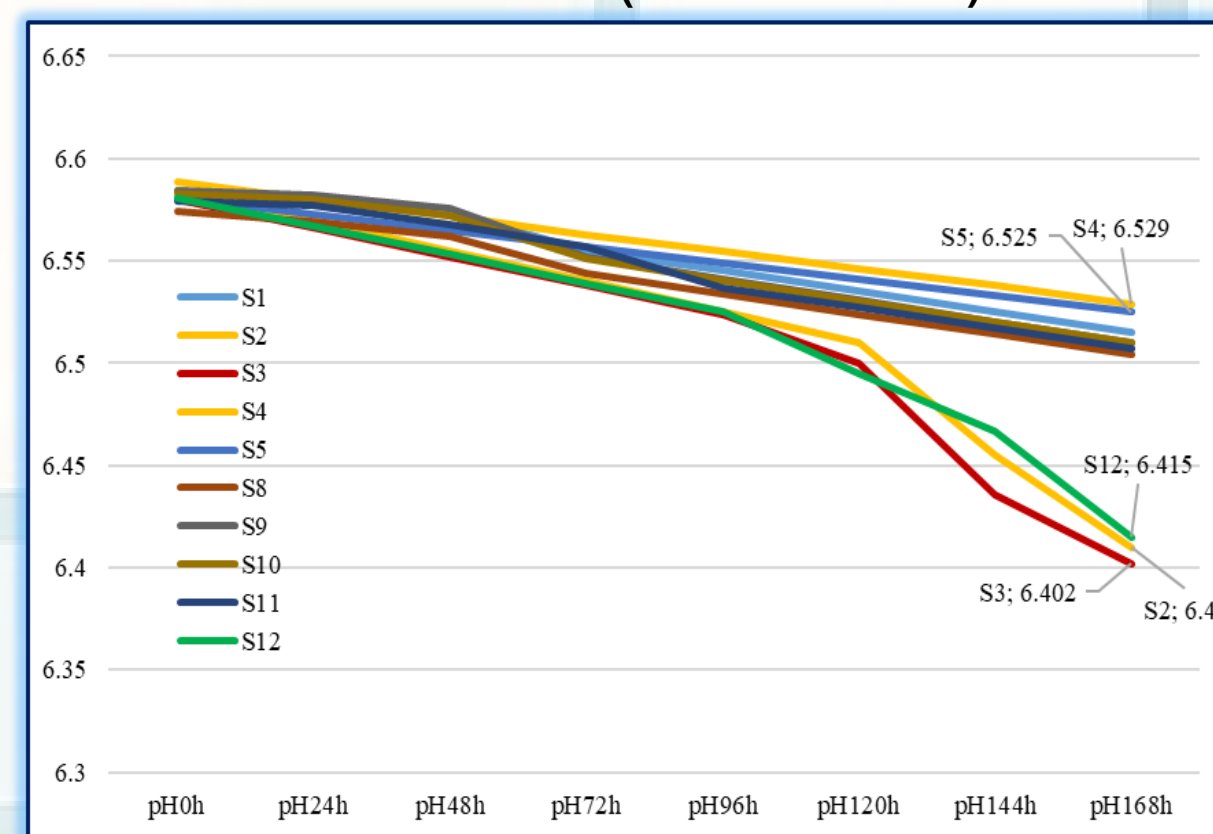


Figure 9. Dynamics of pH in raw milk during cold storage (7 days, +2...+4°C)

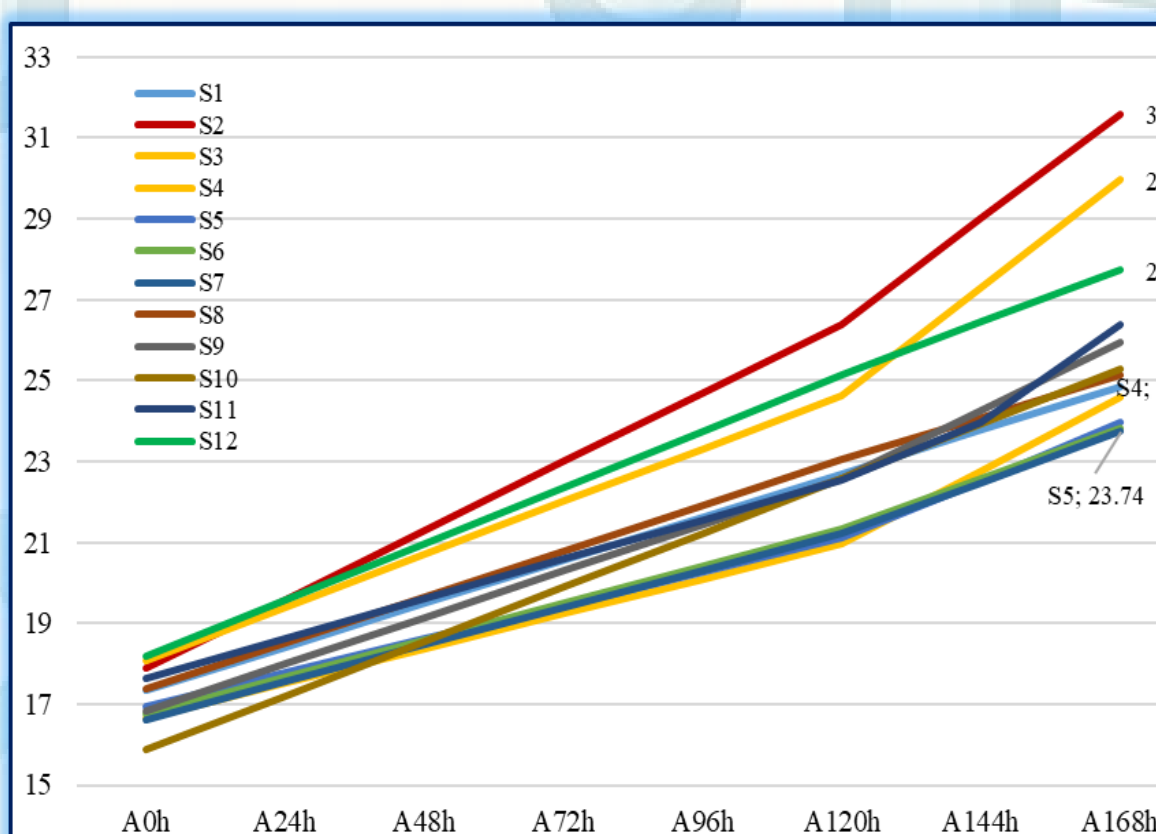


Figure 10. Dynamics of acidity in raw milk during cold storage (7 days, +2...+4°C)

Table 2. Dynamics of acidity in raw milk during cold storage (7 days, +2...+4°C)

Sample	°T _i	°T ₂₄	°T ₄₈	°T ₇₂	°T ₉₆	°T ₁₂₀	°T ₁₄₄	°T ₁₆₈
S1	17.36	18.42	19.49	20.56	21.63	22.7	23.78	24.86
S2	17.89	19.59	21.29	23.27	24.75	26.44	29.24	31.59
S3	18.09	19.46	20.72	22.01	23.31	24.62	27.29	29.96
S4	16.66	17.52	18.38	19.24	20.15	20.96	22.77	24.58
S5	16.95	17.78	18.61	19.44	20.27	21.15	22.52	23.95
S6	16.74	17.66	18.58	19.55	20.42	21.34	22.58	23.81
S7	16.63	17.55	18.47	19.39	20.31	21.23	22.48	23.74
S8	17.39	18.52	19.65	20.78	21.91	23.04	24.09	25.14
S9	16.84	17.99	19.14	20.29	21.44	22.59	24.27	25.95
S10	15.87	17.21	18.55	19.89	21.23	22.57	23.93	25.28
S11	17.65	18.63	19.61	20.59	21.57	22.55	23.97	26.38
S12	18.17	19.57	20.96	22.36	23.75	25.15	26.45	27.74

Conclusions

The chemical composition (fat, protein, lactose, total and non-fat dry matter) was within normal limits, with variations attributed to feeding differences, lactation stage, and environmental factors. This indicates a good technological potential for processing, especially for fermented dairy products.

The hygienic parameters indicate a very good quality of raw milk for most samples (TBC < 30,000 ufc/mL and SCC < 200,000 cells/mL), in accordance with legal requirements. All analyzed samples showed TBC and SCC values below the maximum limits allowed by European Union legislation (100,000 ufc/mL for TBC and 400,000 cells/mL for SCC).

The stability of refrigerated raw milk remained within acceptable limits for 72–96 hours in most samples, as indicated by the evolution of pH and titratable acidity. After this period, a marked decrease in pH and a significant increase in acidity were observed, caused by intense bacterial activity.