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Comparative Analysis of Conventional Heat Treatment vs. Thermosonication for Pathogenic Microorganism Inactivation in Milk Cream

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Consumer interest in safe foods has intensified over the years, prompting in-depth studies on food safety. In the context of dairy products, cream is a standout product. However, due to its nutritious composition, cream can provide a conducive environment for the proliferation of pathogenic microorganisms if not handled or processed adequately. This study compared the efficacy of rapid and slow pasteurization and thermosonication in reducing methicillin-resistant *Staphylococcus aureus* (MRSA) and indicator microorganisms in cream samples. Raw cream samples (35% fat) were obtained from a dairy factory in São Sebastião do Passé, Bahia, Brazil. Five strains of β-lactam-resistant *Staphylococcus aureus* (MRSA) associated with livestock in Brazil were used. MRSA cultures were preserved in a glycerol-enriched culture medium and revitalized before the experiment. For artificial contamination, an MRSA inoculum was added to the cream samples, resulting in a final concentration of 6.82 log CFU/mL. Thermal treatments included rapid pasteurization (72°C for 15 seconds) followed by sonication for durations of 3, 5, and 10 seconds (US1, US2, and US3), and slow pasteurization (65°C for 40 minutes) followed by sonication for 5, 10, and 15 minutes (US4, US5, and US6), varying intensities, durations, and temperatures using a VC 505 ultrasonic processor (Vibra-Cell, Sonics & Materials, Connecticut, USA). The efficacy of the treatments was assessed by microbial counts immediately after processing and during storage (0, 15, and 30 days), following APHA guidelines. Analyses included counts of S. aureus, mesophilic aerobic bacteria, enterobacteria, molds, and yeasts. Microbial inactivation efficiency was calculated in log CFU/mL. The results demonstrated that traditional pasteurization and thermosonication effectively reduced MRSA concentrations. MRSA-inoculated samples initially showed 6.82 log CFU/mL. After rapid pasteurization (IP-72), counts were reduced to 2.00 log CFU/mL, and to 2.39 log CFU/mL with slow pasteurization (IP-65). Both treatments showed a significant increase in counts during storage. Thermosonication reduced counts to 4.14 log CFU/mL (US1) and 4.24 log CFU/mL (US2). During storage, counts significantly increased in US1 to US3, while the US6 treatment maintained levels below 3 log CFU/mL, without variations. Regarding indicator microorganisms, there was variability in the efficacy of the different treatments applied. The combined approach of pasteurization and sonication showed promising results. The synergistic treatment enhances overall microbial reduction, likely due to the dual action of heat and ultrasonic waves. This integrated technique can offer a more comprehensive and robust solution for controlling microbial populations in dairy products, highlighting its potential as an advanced strategy in food safety management. Notably, thermosonication showed superior efficacy, particularly in maintaining reduced microbial levels over an extended period, underscoring its potential advantages in improving food safety protocols.

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