

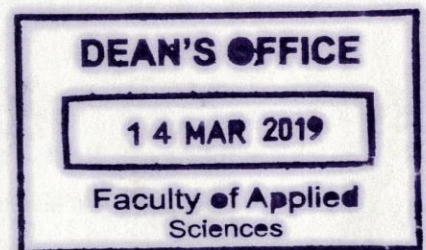
**Improving the efficiency of pasteurization of milk by targeting some
thermoduric bacteria and other possible intervention to reduce the
community of bacteria and development of bacteriophage resistant yogurt
starter culture**

**Thesis submitted to the faculty of Applied Sciences of Rajarata University
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ABSTRACT

Raw milk contains vast number of microorganisms and most of pathogenic bacteria are eliminated by the process called pasteurization. Pasteurization is a means of increasing the shelf-life of milk. Nevertheless, if shelf-life of pasteurized milk could be further increased, that will undoubtedly be profitable to any milk processing factory. In this research, which was carried out at MILCO dairy factory, attention was focused on the possible causes for hampering the prolongation of shelf-life of pasteurized milk and the possible causes for contaminations of raw milk before reaching the factory.

Staphylococcus aureus, *Staphylococcus epidermidis* and *Bacillus cereus* was isolated from freshly pasteurized milk and their synergistic effect in milk spoilage was noted. Assuming that storage at 4 °C would increase the portion of resting cells and sporulation, providing favorable temperature would result in return to vegetative growth. Therefore, raising the temperature to 30 °C and holding at that temperature for varying times prior to pasteurization in a laboratory set up was experimented in order to minimize these bacteria as indicators of thermoduric community during pasteurization. After following this process, bacterial count went down to undetectable levels and the shelf-life of pasteurized milk was increased up to seven or eight days in comparison to four days with regular process.

Applicability of this process needs to be tested by setting a plate system for heating between the silo tank to heat the milk to 30 °C and use the balance tank in the regular process as the storage tank.

Aseptically collected milk samples were used for total colony count, transported through the milk bowsers from different milk chilling centers. In addition to that, the milk quality was evaluated using platform tests (Clot on boiling, KQ test, Alcohol test, milk temperature and density) and microbiological tests (total colony count). Good positive significant correlation was resulted in between milk holding time (from milking to reaching the factory through storage at collection center and transport) and bacterial count ($p < 0.05$, Pearson correlation value: 0.495) emphasizing that the raw milk with longer storage period leads to higher bacterial counts. However remarkable deviations from the general trend were noted, indicating factors other than the milk holding time are responsible for the bacterial counts.

In order to find out these factors, investigations at field level were carried out. A survey on milk quality was conducted in the areas of selected major chilling centers. Quality of raw milk is high in the areas of Ampitiya, Norwood, Kotagala and Ragala where they followed good field level practices. Because of that microbial density of raw milk sampled from those centers were greatly low although their milk holding time during transport is considerably high. Poor sanitary conditions and low attention on dairy farming by the farmers of Nittambuwa, Polgahawela, Thihagoda, Gonapinuwala and Chilaw resulted in high initial bacterial density.

Another aspect considered in this study was loses due to phage attacks on yogurt starter culture. The bacteria in starter cultures (DVS) were isolated using Elliker medium and those *Streptococcus thermophilus* and *Lactobacillus bulgaricus* colonies were differentiated using their

morphological characters. Bacteriophage attack of *Lactobacillus bulgaricus* was identified using selective media.

This phage attack was confirmed by using the setting delay of yogurt. Starter cultures used in MILCO Company were screened for resistant and susceptible strains. Using resistant strains of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, a new starter culture was prepared.

By using that new starter culture, batches of yogurt were prepared in the laboratory to investigate the suitable proportions of the two starter culture bacteria to be used. Sensory evaluation results proved that 1:1 proportion of two strains is the best for high quality yogurt.

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