



Fayoum University



Faculty of Agriculture

**UTILIZATION OF BACTERIOCIN-LIKE SUBSTANCES
PRODUCED BY CERTAIN LACTIC ACID BACTERIA AS
BIOPRESERVATIVES OF SOME DAIRY PRODUCTS**

By

Nesreen Mohammed Nasr Mahmoud

A thesis submitted in partial fulfillment
of
the requirements for the degree of

Master of Science
In
Agricultural Sciences
(Dairy Science and Technology)

Dairy Science and Technology Department
Faculty of Agriculture
Fayoum University
Egypt

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ABSTRACT

In recent times, attention to using biopreservatives in preserving dairy products was increased, for example, metabolites of lactic acid bacteria (LAB). On the other hand, by-products of food industries can be used in the production of such biopreservatives instead of causing environmental pollution.

In this work, we aimed to produce bacteriocin – like substances (BLS) from tested strains of *Lactobacillus rhamnosus* and *Streptococcus thermophilus*, select a low-cost media for the production of BLS and to make trials in using the cell-free culture supernatants (CFCSs) as a biopreservative in most consumed cheeses such as Ras and processed cheese spread.

For achieving these aims, we selected a low-cost media for the production of BLS. Two experimental media were prepared by using permeate (PR) and corn steep liquor (CSL) and compared with standard media (control). The growth rate of the tested strains; antibacterial activity of CFCSs, minimum inhibitory concentration (MIC), minimum lethal concentration (MLC) for dried crude CFCS, partial purification and molecular weight determination of BLS produced by *Lb. rhamnosus* were done.

The total counts of *Lb. rhamnosus* grown in PR supplemented with 5% CSL were insignificantly different from the control media. BLS of both strains was able to inhibit the growth of all tested pathogenic bacteria however, *E.coli* showed significantly wider inhibition zone. Furthermore, the MIC and MLC of *Lb. rhamnosus* CFCS against *Staph. aureus*, *Sal. enteritidis*, *E. coli* and *Lis. monocytogenes* were 2 and 4 mg/ ml, respectively, whereas, there were 4 and 8 mg/ml against *B. cereus*. On the other hand, CFCS of *Lb. rhamnosus* 100% inhibited the growth of tested fungi (*A. flavus*, *A. parasiticus* and *P. roqueforti*) with concentrations of 8 and 16 mg/ ml. The molecular weight of BLS produced by *Lb. rhamnosus* ranged between 20 - 22 kDa.

Dried crude CFCS produced by *Lb. rhamnosus* was used as a biopreservative in Ras cheese. Three concentrations (8, 16 and 32 mg/ml suspension) were superficially added to the cheese blocks and compared with the control and the addition of pot. sorbate. Ripening indices values decreased by increasing the amount of CFCS. Also, free fatty acids (FFA) contents revealed that superficially treating with *Lb. rhamnosus* CFCS has a restricted level of lipolysis caused of fungi. Treatment and ripening period interaction significantly affected all microbiological traits except proteolytic and lipolytic bacteria, whereas, it insignificantly affected all organoleptic properties of Ras cheese.

Also, *Lb. rhamnosus* CFCS was added to processed cheese spread as biopreservative. It was mixed with 0, 4, 8, or 16 mg/g CFCS (control (C), PC₁, PC₂ and PC₃, respectively). Then packed and stored at 7°C and 25°C. Results showed that treatment, storage period and temperature insignificantly affected the total viable count and psychrotrophic bacteria. However, it significantly affected fungi and spore formers. Organoleptic results indicated that treatment significantly affected flavor, appearance and total score. The control had the highest scores however, PC₃ showed significantly lower estimates. Dried CFCS suspension can be used at concentration of 4 mg CFCS /g. this concentration enhanced the microbiological

quality of processed cheese and it had acceptable effect on organoleptic properties of resultant cheese.

Keywords: Bacteriocin – like substances, low-cost medium, *Lb. rhamnosus*, *Str.thermophilus*, corn steep liquor, Permeate, processed cheese and Ras cheese.