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BIOTECHNOLOGICAL POTENTIAL OF LACTIC ACID BACTERIA ISOLATED FROM RAW MILK FROM THE SOUTH OF THE REPUBLIC OF MOLDOVA*

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Abstract

Lactic acid bacteria are crucial in the functional food industry, producing metabolites like exopolysaccharides and bacteriocins. These enhance food's nutraceutical properties, offering health benefits such as protection against oxidative stress, and improved cardiovascular function. Traditionally raw milk is a rich source of microorganisms. This paper presents findings on lactic acid bacteria from Moldovan raw milk and their biotechnological potencial.

Various metabolites, which contribute positively to the nutritional, sensory, and technological aspects of dairy products, are generated by different strains of lactic acid bacteria (LAB) due to their genetic diversity within the species. Consequently, comprehensive molecular and functional characterization of the microbiota in dairy products at the strain level is essential for enhancing autochthonous milk products, creating new starter cultures, and formulating functional foods.

The dairy industry needs indigenous starter cultures to ensure a controlled fermentation and a superior quality of dairy products. The adaptation of LAB to local milk is crucial for obtaining an optimal fermentation and superior quality dairy products, thus supporting the need for the development of autochthonous starter cultures in the Republic of Moldova.

Raw milk and fermented foods are traditionally rich sources of microorganisms with potential benefits for the food industry and health. This brief review presents our key findings on the diversity of LAB in raw milk from southern Moldova, as well as the isolation and characterization of metabolites produced by these bacteria, which could be used in food biotechnology [1].

In the study, 150 raw milk samples were collected from the southern region of the Republic of Moldova. The results showed that Moldovan raw milk mainly contains mesophilic LAB, with lactococci and streptococci being the predominant types, as noted in Bergey's Manual of Systematic Bacteriology. Some samples also had lactobacilli. The presence of thermophilic LAB is typical in the southern regions of Moldova.

During the examination of cultural properties, we determined the following: colony diameter, shape (circular, punctiform, filamentous, irregular, lenticular, etc.), edge characteristics (smooth, wavy, filamentous, lobate, etc.), surface (flat, convex, raised, pointed, etc.), color (white, yellow, cream), structure (homogeneous, heterogeneous, granular, etc.), and consistency (viscous, greasy, dry, etc.).

In this study, we focused on selecting thermophilic lactic acid bacteria to develop starter cultures for yogurt production. We identified and selected 5 strains of *Streptococcus thermophilus* L 06, L 19, L 22, L 35, L 38 and 2 strains of *Lactobacillus bulgaricus* L 42, L 45.

The selected strains, when cultured in a milk hydrolysate agar medium, form colonies with the following characteristics: on the surface, they are round, drop-shaped with smooth edges (type S); in depth, they appear lenticular and have a white-cream color; in terms of size, they are small (up to 1 mm) with a pasty and greasy consistency.

The initial assessment of bacterial cell morphology is crucial for final identification. For *S. thermophilus*, the following morphological parameters were studied: cell shape and arrangement, mobility, size, and Gram staining characteristics. The morphological study of lactic acid bacteria strains relies on microscopic examination of stained and fixed preparations.

The testing of bacteria for EPS production was conducted using protein separation from the culture medium with trichloroacetic acid and polysaccharide precipitation with ethanol. The research identified 4 EPS-producing strains — three of S. thermophilus and one of L. bulgaricus.

Thus, of the 4 native thermophilic lactic acid bacteria strains with high and stable EPS production activity, which meet the technical requirements for yogurt coagulation, some can serve as alternatives to stabilizers used in the dairy industry. The research demonstrates the potential to select native lactic acid bacteria strains with natural technological potential (non-genetically modified) and use them in producing safe dairy products.

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To assess the antibacterial activity of selected *S. thermophilus* strains, *S. aureus* ATCC® 25923™ and *E. coli* ATCC® 25922™ were used as test cultures. The antagonistic activity of these thermophilic streptococci was evaluated using the agar diffusion method. The results demonstrate significant antagonistic effects against pathogenic microorganisms, with inhibition zones ranging from 16 to 18 mm for *E. coli* and 19 to 21 mm for *S. aureus*. This suggests that the selected strains are effective in inhibiting the growth of intestinal infections.

Our research demonstrates that natural environments, such as traditional fermented foods, are highly diverse and serve as valuable sources of new strains and species within the LAB group. These strains possess functional properties, such as bacteriocin or EPS production, and exhibit prebiotic or probiotic effects, making them promising candidates for biotechnological applications.

References

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