

ANTIBACTERIAL ACTIVITY OF LACTIC ACID BACTERIAL STRAINS ISOLATED FROM SPONTANEOUS YOGURTS USED IN GORANBOY REGION (Azerbaijan)

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Abstract. The presented article is devoted to the study of antimicrobial activity of lactic acid bacteria isolated from spontaneous yogurts used in the region of Goranboy (Azerbaijan). To determine the antimicrobial activity of lactic acid bacteria the strains of *Streptococcus* spp. BDU - GY1, BDU - SV7, BDU - AI14, *Lactobacillus* spp. strains BDU - GY2, BDU - SV8, BDU - YL4, BDU - DI6 were used. These strains were studied from the collection of cultures in the Department of Molecular Biology and Biotechnology for antimicrobial activity against pathogenic conditional-pathogenic- gram-positive *Bacillus subtilis* TU-1, *Staphylococcus aureus* TU-4 and gram-negative *Escherichia coli* TU-2 test cultures. The highest antimicrobial activity among the strains was studied in *Lactobacillus* BDU-SV8 and BDU-DI6 strains. The lysis zone of these strains against gram-positive bacteria was defined as 24 mm.

Keywords: Lactic acid bacteris, opportunistic bacterial pathogen, antimicrobial activity.

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1. Introduction

Lactic acid bacteria are known as non-spore-forming, gram-positive, microaerophilic, and lactic acid-producing bacteria. Lactic acid bacteria have a special role among the microorganisms that spread in food. The most important feature of these types of bacteria is that they have a function in the biosafety of food. This characteristics depends on the antimicrobial substances they produce as a result of metabolism (Jafarov, 2019, Wu *et al.*, 2017).

Yogurt has a special place in sour milk products and is distinguished by its positive properties. Yogurt is a plentiful source of minerals, spreads and carbohydrates. Lactic acid bacteria isolated from dairy products have a bacteriostatic effect, interfering the cell membrane of the pathogen, causing membrane permeability, loss of cell composition and, consequently, cell lysis and death (Zhou, 2019, Eiteman, 2015).

Lactic acid and formic acid, considered the final products of the fermentation process, change the pH of the solution to acidity. Metabolites such as propionic acid, acetoin, hydrogen peroxide, and diacetyl are also formed during the life activity of lactic acid bacteria (Alvazer-Sieriro, 2016, Azhar *et al.*, 2017).

One of the forms of interaction between microbial cultures during the life activity is antagonism. The protective effect of lactic acid bacteria is due to the antimicrobial substances they produce as a result of the metabolic process. Antimicrobials have a high degree of effect and effectiveness. The antimicrobial substances synthesized by these microorganisms give them an advantage over others (Masoumikia *et al.*, 2017).

In this regard, the antimicrobial properties of some strains of lactic acid bacteria isolated from yogurt prepared by spontaneous yeast used by the population in the Goranboy region were studied against some conventional pathogenic bacteria.

2. Materials and methods

Spontaneous yogurt samples taken from Goranboy district center, Dalimmadli, Sarov, Yeniyol and Alirzali villages were used as the object of research. The samples were delivered to the Microbiology Laboratory of the Faculty of Biology of Baku State University within 6-8 hours with a special cooling chamber. The sour milk products delivered to the laboratory were first diluted. After the dilution process, 0.1 ml of the suspensions were added to Petri dishes and kept in a thermostat at 35°C for 3 days. At the end of the incubation period, colonies were observed in the Petri dishes.

Gram staining and catalase tests were used to identify colonies formed in Petri dishes. Gram + and catalase - lactic acid bacteria were used for the next stage.

BDU-GY1, BDU-SV7 and BDU-AI 14 belonging to the type of *Streptococcus* isolated from the samples, BDU-GY2, BDU-SV8, BDU-YL 4 and BDU-DI6 lactic acid belonging to the type of *Lactobacillus* are microbial pathogens against bacterial strains antibacterial properties that were studied. For this process, the test organisms used were the bacterial strains of pathogenic gram-positive *Bacillus subtilis* TU-1, *Staphylococcus aureus* TU-4 and gram-negative *Escherichia coli* TU-2 obtained from the collection of cultures of the Department of Molecular Biology and Biotechnology. Antimicrobial activity against conventional pathogenic bacteria was studied by hatching and agar block method.

3. Results

Antimicrobial activity and effectiveness of *Streptococcus spp.* BDU - GY1, BDU - SV7, BDU - AI14, *Lactobacillus spp.* BDU - GY2, BDU - SV8, BDU - YL4, BDU - DI6 acid bacterial strains were determined.

The effect of *Lactobacillus sp.* BDU-GY2 on test bacteria was distinct. Thus, it was 11-12 mm for *Bacillus subtilis* TU-1 strain and 12-14 mm for *Staphylococcus aureus* TU-4 strain. There was a strain of *Escherichia coli* TU-2 that was weakly affected by conventional pathogenic microbial cultures. Thus, the lysis zone against this strain was 4 - 6 mm (Table 1).

The antimicrobial activity of *Streptococcus sp.* BDU - GY1 lactic acid bacterial strain was found to have antimicrobial activity against gram-positive and gram-negative bacteria. The lysis zone for Gram-positive test cultures was 7-9 mm for *Bacillus subtilis* TU-1 strain and 9-11 mm for *Staphylococcus aureus* TU-4 strain. And this index against gram-negative *Escherichia coli* - TU2 test culture was 8 - 10 mm (Table 1).

By showing antimicrobial activity against test cultures of *Streptococcus sp.* BDU-AI14 lactic acid bacterial strain, the test bacterium had a moderate effect on gram-negative *Escherichia coli* - TU2 strain (lysis zone 9-11 mm). Gram-positive test bacteria formed a lysis zone of 11 - 13 mm against *Staphylococcus aureus* BDU - TU4 strain, and 10 - 12 mm lysis zone against *Bacillus subtilis* BDU - TU 1 test culture (Table 1).

Lactobacillus sp. BDU - SV8 lactic acid bacterial strain showed high antimicrobial activity against gram-positive *Bacillus subtilis* BDU - TU 1 test bacteria. The test antibacterial lysis zone was 22 - 24 mm. The lysis zone against *Staphylococcus*

aureus BDU-TU 4 strain was determined to be moderate (14-16 mm). The lysis zone against *Escherichia coli* - TU2 strain was 18-20 mm (Table 1).

Table 1. Antibacterial activity of lactic acid bacteria strains

Lactic acid bacteria strains	Test cultures		
	<i>Bacillus subtilis</i> BDU – TU 1	<i>Escherichia coli</i> BDU - TU2	<i>Staphlyococcus aureus</i> BDU – TU4
<i>Lactobacillus sp.</i> BDU – GY2	11-12	4-6	12-14
<i>Streptococcus sp.</i> BDU – GY1	7-9	8-10	9-11
<i>Streptococcus sp.</i> BDU – SV7	13-15	16-18	15-17
<i>Streptococcus sp.</i> BDU – AI14	10-12	9-11	11-13
<i>Lactobacillus sp.</i> BDU – SV8	22-24	18-20	14-16
<i>Lactobacillus sp.</i> BDU – YL4	11-13	9-11	12-14
<i>Lactobacillus sp.</i> BDU – DI6	16-18	14-16	22-24

The lysis zone against gram-positive *Staphlyococcus aureus* BDU-TU 4 strain of *Lactobacillus sp.* BDU-YL4 lactic acid bacterial strain was 12-14 mm. A medium lysis zone against *Bacillus subtilis* BDU - TU 1 test bacteria was observed. The size of the lysis zone was defined at 11-13 mm. The lysis zone against the gram-negative *Escherichia coli* - TU2 strain was 9-11 mm (Table 1).

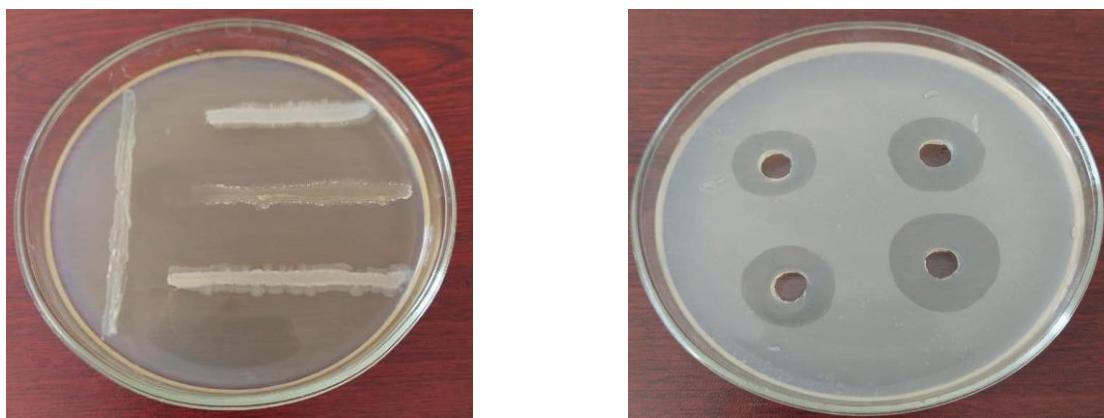


Fig. 1. Antimicrobial activity of *Streptococcus sp.* BDU - SV7 lactic acid bacterial strain

Streptococcus sp. BDU - SV7 lactic acid bacterial strain showed moderate antimicrobial activity against Gram-negative *Escherichia coli* - TU2 test culture and the lysis zone was 16-18 mm. The lysis zone was defined against *Bacillus subtilis* TU-1

culture as 13-15 mm, and the lysis zone for *Staphylococcus aureus* TU-4 strain was 15-17 mm (Table 1, Fig.1).

Lactobacillus sp. BDU - DI6 lactic acid bacterial strain had a high lysis zone against test bacteria. Thus, Gram-negative *Escherichia coli* formed a lysis zone of 14-16 mm against the BDU-TU2 test strain. The lysis zone against Gram-positive *Staphylococcus aureus* BDU-TU 4 strain was 22 - 24 mm. A medium lysis zone was observed against *Bacillus subtilis* BDU - TU 1 test bacteria. The size of the lysis zone was determined to be 16-18 mm (Table 1).

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