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THE ANTAGONISTIC PROPERTIES OF LACTOBACILLI ISOLATED IN DIFFERENT REGIONS

Abstract

Antagonistic activity of Lactobacillus has been tested for 34 strains isolated from different ecological niches and five collection strains. Agar-well diffusion method was used to test the antagonistic effect. Test cultures were C. albicans, E.coli, B. subtilis, P. aeruginosa та S. aureus.

Among all investigated strains of Lactobacillus 79,5 % showed antagonistic activity of at least one of the test cultures.The most antagonistic active were strains of Lactobacillus isolated from pickled eggplants (Odessa region).

Key words: antagonistic effect, Lactobacillus spp., agar-well diffusion method

Introduction

Search for new strains of bacteria of the genus *Lactobacillus*, which exhibit high antagonistic activity is an important and promising area of microbiology. Lactobacilli inherent antagonistic properties, so that they inhibit the growth of unwanted microbiota during production and the finished product, and adjust dysbiotic violation.

There are different mechanisms for control and inhibition of other microbes, e.g. nutrient competition, production of inhibitory compounds, immunostimulation and competition for binding sites. Among these activities, the production of organic acids (such as lactic acid), which results in lowered pH, is the most important. Additionally, certain strains are also capable of producing bioactive molecules, such as ethanol, formic acid, fatty acids, hydrogen peroxide and bacteriocins, that have antimicrobial activity [2, 4]. The aim of this study was to determine the antagonistic activity bacteria *Lactobacillus* isolated from the different habitats and different regions and to determine the extent of their antagonistic activity.

Materials and methods

Research materials were 34 strains of bacteria of the genus *Lactobacillus,* isolated from different habitats: from neonatal gastrointestinal (Odessa region): *Lactobacillus spp.* 13, 20, 87, 146, 175, 275, 291, 892, 921, 12λ; from raw meat (Odessa region): *Lactobacillus spp.*M1, M2, M3, M4, M5, M6; from pickled eggplants (Odessa region): *Lactobacillus spp.*B1, B3, B4, B5, B6; from pickled vegetables (Vietnam): *Lactobacillus spp.*5, 6, 8, 13, 14b, 24b, 29b, 31b, 32, 54m; from pickled cucumbers (Sweden): *Lactobacillus spp.*O1, O5, O6 (tab. 1) and 5 collection strains: *L. buchneri* ATCC 4005, *L. acidophilus* ATCC 32200, *L. plantarum* VTCC 0921, L. plantarum UCM B 11/16 and *L. plantarum* UCM B 2209.

The antagonistic properties of the isolated strains against test cultures: *Candida albicans* UCM У 2501^{T}, *Escherichia coli* UCM B 906, *Staphylococcus aureus*, *Bacillus subtilis* and *Pseudomonas aeruginosa* were determined.

Agar-well diffusion method was used to determine the inhibitory effect [1]. To determine antagonistic activity previously prepared daily culture of lactic acid bacteria and test cultures. Then spent preparing microbial suspension test cultures of microorganisms daily bouillon cultures for cell concentration of 1,5 × 10^{8} CFU/cm^{3}. Then 0.1 cm^{3} bacterial suspension test cultures bring in the prepared of the agar plates. Wells, 8 mm in diameter, were punched in the agar plates and 0,2 cm^{3} of daily bouillon native culture lactobacilli were added to the wells. After incubation overnight at temperature conditions indicator test cultures, the antimicrobial activity was expressed as the diameter of the zones lack of growth (mm) around the wells [1].

The extent of antagonist activity was determined by the following criteria:

- lack of growth zone diameter 1 - 15 mm - low antagonistic activity;
- lack of growth zone diameter of 16 - 25 mm - middle antagonistic activity;
- lack of growth zone diameter of 25 mm or more - high antagonistic activity [1].

Results and discussions

Antimicrobial activity is a very important criterion for selection of starter and probiotic culture as natural antagonists of potentially harmful bacteria. Antagonistic activity of *Lactobacillus* has been tested for 34 strains isolated from different ecological niches and five collection strains.

Nearly all strains of lactic acid bacteria isolated from the

gastrointestinal tract of infants (except *Lactobacillus sp.* 87, *Lactobacillus sp.* 921) antagonists were quite active against gram-negative bacteria *E. coli* and *P. aeruginosa*, as well as gram-positive microorganisms *S. aureus*. *Lactobacillus sp.* 175 showed the highest antagonistic activity against these test cultures diameter zones lack of growth varied within the following limits: *E. coli* – 28,33 ± 1,73 mm, *P. aeruginosa* – 25,66 ± 2,36 mm, *S. aureus* – 23,0 ± 1,13 mm.

Among the bacteria of the genus *Lactobacillus*, isolated from raw meat *Lactobacillus spp.* M1, M2, M3 and M6 showed themselves as active antagonists against all prokaryotic test cultures.

The most active antagonist of *Lactobacillus* strains Odessa region was isolated from pickled eggplant. The most active antagonist for test cultures *E. coli, B. subtilis* and *P. aeruginosa* was strain B1, lack growth areas were 37,66 ± 1,73 mm, 31,0 ± 1,13 mm and 33 0 ± 2,26 mm respectively.

Lactobacilli isolated from pickled vegetables from other regions characterized by antagonism less pronounced compared to the strains of the Odessa region.

The lowest activity showed strains of bacteria of the genus *Lactobacillus*, isolated from Vietnamese pickled vegetables. We can assume that there is a relationship presence of antagonistic activity of *Lactobacillus* region of origin. Less antagonistic activity of these strains may be associated with the transportation device isolates and strains to other conditions exist [3, 5].

It is interesting to note that among all tested lactobacilli isolated from different regions of only one strain inhibited the growth of *C. albicans* – *Lactobacillus sp.*54m isolated from pickled vegetables (Vietnam Origin).

Collection strains bacteria genus Lactobacillus showed less antagonist activity.

Results determination the extent of antagonistic activity of lactic acid bacteria, are shown in Fig. 1.

The nearly half of the investigated lactobacilli demonstrated a high extent of antagonism against gram-negative microorganisms. The third of strains was characterized of middle antagonistic activity against gram-positive test cultures.

The low extent of antagonist activity was inherent in a small number of bacteria of the genus *Lactobacillus.*

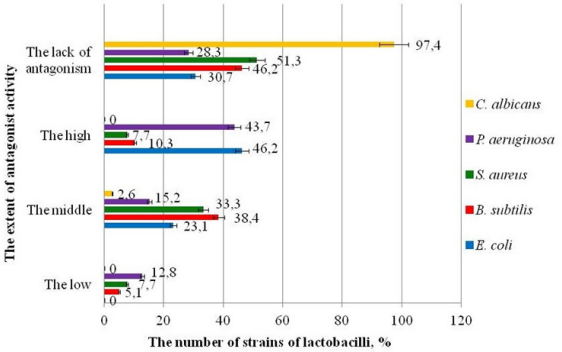

Fig. 1. Average the extent antagonistic activity of *Lactobacillus sp.* in relation to the test cultures

Conclusions

So during this study were able to identify 39 inherency antagonistic properties of *Lactobacillus* strains, of which 79.5% lactobacilli showed antagonistic activity against at least one of the test cultures. Five strains (*Lactobacillus spp.* B1, B3, B4, B5 and B6), which is isolated from pickled eggplant (Odessa region) are the most active antagonist for prokaryotic microorganisms.

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