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# Starter cultures of lactic acid bacteria for special diet products

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## Abstract

From fresh and fermented vegetables (cucumber, sauercraut, eggplant), cereals (wheat, rice), legumes (soy) 37 cultures of lactic acid bacteria were isolated. Based on biochemical characteristics, MALDI-TOF MS protein profiling and 16S rRNA gene sequencing they were identified as representatives of *Lactobacillus*, *Lactococcus*, *Leuconostoc*, *Pediococcus* and *Enterococcus* genera. Six members of *Lactobacillus* genera and two members of *Leuconostoc* genera actively producing EPS were selected for further investigation as components of starters for production of special dietetic foodstuffs.

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## Introduction

Lactic acid bacteria are important microorganisms for biotechnological applications. They are used in various fields, including the food industry for manufacturing of dairy products. Increasingly frequent cows-milk allergies among population of developed countries has led to campaign for exclusion of animal products from the diet, growing consumer interest in hypoallergenic plant-based analogs of dairy products possessing similar organoleptic and functional properties (1). Traditional dairy starter cultures display low enzymatic activity in regard to plant materials. Investigations should be performed to screen promising starter cultures from lactic acid bacteria isolated from plant sources (2).

The aim of the study was to conduct screening of microbial isolates from plates of lactic acid bacteria to be further used in manufacturing plant-based analogs of dairy products.

## Materials and Methods

Lactic acid bacteria were isolated from fresh and fermented plant material. Identification was based on the results of analysis of phenotypic, biochemical and molecular genetic characteristics of isolated cultures. Exopolysaccharide (EPS) production tests were carried out using a standard method suggested by Knoshaug et al. (3).

## Results and Discussion

From fresh and fermented vegetables (cucumber, sauerkraut, eggplant), cereals (wheat, rice), legumes (soy) 37 cultures of lactic acid bacteria were isolated. On the basis of mor-

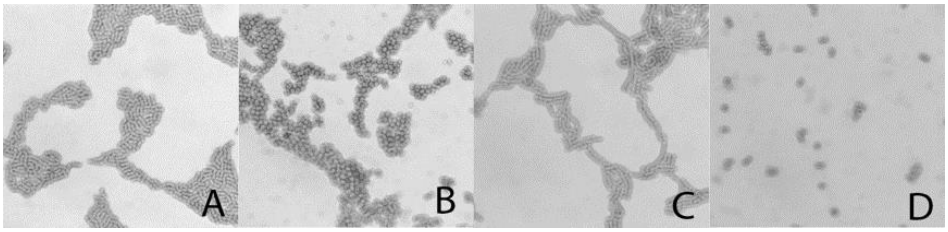


**Figure 1.** Cell morphology of lactic acid bacteria, isolated from plant material, De Man-Rogosa-Sharpe (MRS) agar, 37°C, 24h, light microscopy, 1000X; A. isolate Og 3.1; B. isolate Sbr 3; C. isolate B 3; D. isolate K 3.1.

**Table 1. Biochemical characterization MALDI-TOF MS and genetic identification of lactic acid bacteria isolated from plant material**

| № | Isolate | Biochemical characterization | MALDI-TOF MS | 16S rRNA gene sequencing |
|---|---|---|---|---|
| 1 | Psh 3 | *Leuconostoc citreum* | *Leuconostoc citreum* | *Leuconostoc citreum* |
| 2 | Sbr 2 | *Pediococcus acidiliactici* | *Pediococcus pentosaceus* | *Pediococcus acidiliactici* |
| 3 | Og 3.1* | *Lactobacillus plantarum* | *Lactobacillus plantarum* | *Lactobacillus plantarum* |
| 4 | B2 | *Lactobacillus brevis* | *Lactobacillus brevis* | *Lactobacillus brevis* |
| 5 | B3* | *Lactobacillus plantarum* | *Lactobacillus plantarum* | *Lactobacillus plantarum* |
| 6 | B4 | *Lactococcus lactis* subsp *.lactis* | *Enterococcus faecium* | *Enterococcus faecium* |
| 7 | B5 | *Lactococcus lactis* subsp. *lactis* | *Enterococcus faecium* | *Enterococcus faecium* |
| 8 | Sbr 6 | *Enterococcus* sp. | *Lactococcus garvieae* | *Lactococcus garvieae* |
| 9 | S 1 | *Enterococcus dispar* | *Lactococcus garvieae* | *Lactococcus lactis* |
| 10 | S 2 | *Enterococcus dispar* | *Enterococcus faecium* | *Enterococcus faecium* |
| 11 | K 3.1 | *Enterococcus dispar* | *Lactococcus garvieae* | *Enterococcus durum* |
| 12 | K 3.4* | *Lactobacillus plantarum* | *Lactobacillus rhamnosus* | *Lactobacillus rhamnosus* |
| 13 | K 3.5* | *Lactobacillus sp.* | *Lactobacillus plantarum* | *Lactobacillus plantarum* |
| 14 | K 3.6* | *Lactobacillus sp.* | *Lactobacillus rhamnosus* | *Lactobacillus rhamnosus* |
| 15 | Og 4.1* | *Lactobacillus plantarum* | *Lactobacillus rhamnosus* | *Lactobacillus rhamnosus* |
| 16 | K 1.5* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* |
| 17 | K 1.5 | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* |
| 18 | K 2.3 | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* |
| 19 | K 2.4 | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* |
| 20 | K 2.5* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* |
| 21 | K 2.7 | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* | *Leuconostoc mesenteroides* subsp. *mesenteoides* |

Note. * - exopolysaccharide producing strains

phological and biochemical characteristics the isolated cultures were identified as members of *Lactococcus*, *Enterococcus*, *Leuconostoc*, *Pediococcus* and *Lactobacillus* genera. (**Fig. 1**).

For 21 isolate taxonomic identification was confirmed by MALDI-TOF mass-spectrometry protein profiling and 16S rRNA gene sequencing (**Table 1**).

## Conclusions

Based on a complex of biochemical characteristics, EPS production ability and unquestionable taxonomic status 6 strains of the genus *Lactobacillus* and 2 strains of *Leuconostoc* were selected for further investigation as promising components of starters for manufacturing of products for special dietary needs.


### Acknowledgements

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### Conflict of interest statement

The Authors do not have any competing interests or conflicts of interest.

### References


1. Mäkinen OE, Wanhalinna V, Zannini E, Arendt EK. Foods for special dietary needs: Non-dairy plant based milk substitutes and fermented dairy type products. Crit Rev Food Sci Nutr 2016; 56(3):339-49.
2. Siezen RJ, Starrenburg MJ, Boekhorst J, Renckens B, Molenaar D, van Hylckama Vlieg JE. Genome-scale genotype–phenotype matching of two *Lactococcus lactis* isolates from plants identifies mechanisms of adaptation to the plant niche. Appl Environ Microbiol 2008; 74: 424–436.
3. Knosaug EP, Ahlgren JA, Trempy JE. Growth associated exopolysaccaride expression in *Lactococcus lactis* subspecies *cremoris* Ropy352. J. Dairy Sci 2000; 83(4): 633–640.