

INVESTIGATION OF ANTIBACTERIAL METABOLITES OF LACTIC ACID BACTERIA AGAINST PHYTOPATHOGENIC BACTERIA

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Many bacteria cause plant diseases. For example *Pectobacterium carotovorum* causes bacterial soft rot, vascular necrosis, and blackleg of potato and other vegetables (carrot, potato, tomato, leafy greens, squash and other cucurbits, onion, green peppers). *Xanthomonas vesicatoria* causes bacterial leaf spot on peppers and tomatoes, *Agrobacterium tumefaciens* causes plant tumors also known as crown galls.

The primary method of control of vegetable and fruit microbiological spoilage is the use of chemical fungicides. An effective alternative of chemical fungicides may become the lactic acid bacteria (LAB). LAB are the basis of effective and environmentally friendly microbiological preparations that can be used to protect plants and stimulate their vital processes. LAB produce metabolites that possess the antimicrobial activity against phytopathogenic bacteria. In a previous study, we investigated antagonistic activity of LAB strains isolated from fermented vegetables against 8 strains of phytopathogenic bacteria. We selected 11 LAB cultures that had a wide range of antagonistic activity for all indicator strains used. The aim of the study was to investigate the metabolites of lactic acid bacteria with antibacterial action against phytopathogenic bacteria. The task of the present work was determination the role of organic acids, hydrogen peroxide and compounds of proteinous nature in the antagonistic action of selected LAB strains against phytopatogenic bacteria strains. Cell-free culture supernatants were obtained by centrifugation (5000 rpm for 15 min) of LAB cultures grown in MRS broth at 30 °C for 18-20 h. The supernatants were filtered through 0.45-µm filter to remove residual cells. To determine the organic acids function the neutralized supernatants were used. Catalase and proteinase K were used for determination of role of hydrogen peroxide and proteinous substances in pathogens inhibition respectively. The main antimicrobial substances produced by LAB strains were organic acids. After neutralization cell-free supernatants 8 from 11 LAB strains lost their antagonistic activity against phytopathogenic bacteria. So, it can be assumed that organic acids were the major substances produced by the LAB strains that were capable to inhibit growth of phytopathogenic bacteria. It should be noted that the antagonistic activity persisted in 3 strains (*L. plantarum* 21c, *L. plantarum* 23c, *L. plantarum* 1026 fc) and zones of growth inhibition averaged from 10 to 16 mm. After treatment of supernatants by the catalase the antagonistic activity of the *L. plantarum* 1026 fc strain was lost. It can be assumed that antagonistic activity of *L. plantarum* 1026 fc was mediated by production of hydrogen peroxide as the inhibition compound. After exposure of proteinase K antagonistic activity of *L. plantarum* 21c strain was kept. This indicates that *L. plantarum* 23c and *L. plantarum* 1026 fc strains produced a bacteriocin-like inhibitory substance of proteinous nature.

Organic acids were the main substances produced by 8 from 11 LAB strains which were capable to inhibit the growth of phytopathogenic bacteria, but this does not exclude the synthesis of metabolites with other nature. The antagonistic activity of *L. plantarum* 1026 fc against phytopathogenic bacteria strains was due to formation of H₂O₂, and the *L. plantarum* 23c strain – due to synthesis of antimicrobial substances of proteinous nature.

