

INFLUENCE OF CULTIVATION CONDITION FOR ORGANIC ACIDS PRODUCTION BY *LACTOBACILLUS PLANTARUM*

Vasyliuk O., Garmasheva I.

D.K. Zabolotny Institute of Microbiology and Virology of the NAS of Ukraine,
Department of physiology of industrial microorganisms

e-mail: olyav345@gmail.com

Phytopathogenic bacteria cause many different plant diseases and do harm to agriculture. The use of pesticides and chemical fungicides is the main method of control for phytopathogenic microorganisms. One of the alternative trends in biological plant protection is the development and use of biological products based on bacterial antagonists, which synthesize a wide spectrum of metabolites active against bacteria and fungi that cause plant diseases in agriculture. Lactic acid bacteria show a strong antagonistic effect against phytopathogenic bacteria due to organic acids, hydrogen peroxide, bacteriocins, short-chain fatty acids synthesized by them. The production of metabolites depends not only on the individual characteristics of the strain-producer, but also on the cultivation conditions - the pH and composition of the medium, temperature and duration of cultivation. **The aim of the study** was to investigate the effect of cultivation conditions on the synthesis of organic acids by *L. plantarum* strains and their effect on the antagonistic activity against phytopathogenic microorganisms. **Materials and methods.** Quantitative composition of organic acids of cell-free supernatant of *L. plantarum* strains was investigated by high-performance liquid chromatography (HPLC). The influence of different physical parameters of cultivation on *L. plantarum* antagonistic action (pH of medium, temperature and duration) was tested. Role of organic acids in the manifestation of antagonistic activity of four *L. plantarum* strains was determined by measuring of diameter of inhibition zone around the discs with cell-free culture supernatants (CFS). **Results.** The content of organic acids in the culture fluid of 4 strains of *L. plantarum* was studied. It was found that all strains synthesized four organic acids - lactic, acetic, citric and succinic acids in quantities from 0.1 to 1.3 mg/mL. All studied *L. plantarum* strains synthesized the most amount of succinic acid (0.8 - 1.3 mg/mL), while the amounts of citric acid was produce less - from 0.1 to 0.13 mg/mL. *L. plantarum* 1112 fs strain synthesized almost equal amounts of acetic and succinic acids (0.8 - 0.9 mg/mL). 12 experiments with a combination of variables were performed to examine the combined effect of temperature, pH, and duration of cultivation on the synthesis of organic acids and antimicrobial activity of each *L. plantarum* strain against phytopathogenic bacteria. It was found that antagonistic activity of *L. plantarum* 13c strain against phytopathogenic bacteria during 48 hours of cultivation was highest at pH 7.8 and 23°C and pH 6.8, and 30°C. Under these conditions zones of growth inhibition of indicator strains were 17.25±0.5mm and 16.88±0.5mm, respectively. The highest antagonistic activity against phytopathogenic bacteria *L. plantarum* strains showed at 72 hours of cultivation and 23°C then zones of growth inhibition of the indicator strains reached 18.62±0.5mm. Parameters of cultivation (duration, temperature and pH of the medium) were affected the synthesis of lactic and acetic acids. It can be assumed that *L. plantarum* 13c would synthesize the largest amount of acetic acid under following conditions of cultivation: pH 7.8, at 72 hours and 23°C. **Conclusions.** Among organic acids all studied *L. plantarum* strains synthesized the largest amounts of succinic acid (0.8 - 1.3 mg/mL). The highest antagonistic activity of the strains *L. plantarum* against phytopathogenic bacteria was highest at time 72 hours and 23°C and zones of growth inhibition of the indicator strains was 18.62±0.5mm. Optimum parameters for acetic acid production by *L. plantarum* 13c were following: pH of medium – 7.8, temperature - 23°C and duration of cultivation - 72 hours.

