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Evaluation of Lactic Acid Bacteria for Potential Probiotic: Biochemical characterization, Resistance to Antibiotics, Bile Salts, and Low pH Conditions

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Abstract

This study aimed to evaluate the enzymatic characteristics, acid and bile salt tolerance, and antibiotic resistance profiles of lactic acid bacteria (LAB) to identify potential probiotic candidates and enzyme producers. Several LAB isolates exhibited diverse enzymatic activities, including L-aspartase, β-glucosidase, and esculin hydrolase, which are associated with amino acid metabolism, glycoside hydrolysis, and improved nutrient bioavailability. Isolates P1a and P1e demonstrated the highest

enzymatic potential. Tolerance testing revealed that isolates P5c, P5a, and P5d exhibited resistance to both 0.3% bile salts (≥70%) and acidic conditions at pH 2.5 (≥50%), indicating their ability to survive gastrointestinal conditions. Antibiotic susceptibility testing revealed variable resistance patterns; notably, isolate P5d exhibited full susceptibility, highlighting differences in safety profiles. The integration of enzymatic, stress tolerance, and resistance data allowed the selection of promising candidates such as P5a and P5d, which combine beneficial enzyme activity, gastrointestinal survivability, and minimal antibiotic resistance. These findings suggest potential applications in the food industry. However, the study is limited by the lack of molecular identification and in vivo validation. Future research should incorporate genetic analysis and functional testing in biological models to confirm safety and efficacy. Overall, this study contributes to the development of safe and functional LAB strains for industrial applications.