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Investigating the antimicrobial properties of *Lactobacillus casei* and white tea (*Camellia sinensis*) extract on *Escherichia coli* and *Listeria monocytogenes*

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Extended Abstract

Introduction: Foodborne illnesses caused by pathogenic bacteria such as *Escherichia coli* and *Listeria monocytogenes* represent a major public health concern globally. These bacteria contribute significantly to morbidity, mortality, and high treatment costs. Antibiotics have traditionally been used to combat these pathogens; however, the rise of antibiotic resistance has prompted the search for alternative antimicrobial agents with fewer side effects. Probiotics, particularly *Lactobacillus casei*, have shown promising antimicrobial properties, which, when combined with plant-derived compounds like white tea (*Camellia sinensis*), could provide a novel, effective solution. White tea, known for its high polyphenol content and minimal processing, has demonstrated antimicrobial effects against a variety of microorganisms. This study explores the antimicrobial properties of *Lactobacillus casei* and white tea extract against *Escherichia coli* and *Listeria monocytogenes*, as well as the potential synergistic effects when these two are combined.

Methods: White tea extract was prepared by steeping 10 grams of dried white tea in 100 milliliters of water for 48 hours, followed by filtration and sterilization under UV light. The antimicrobial activity of the extract was evaluated using the disk diffusion method against *Escherichia coli* and *Listeria monocytogenes* strains. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the white tea extract were determined using broth dilution assays. *Lactobacillus casei* was cultured anaerobically, and its supernatant, which contains antimicrobial metabolites, was separated by centrifugation. The antimicrobial activity of the supernatant and its synergistic effect with the white tea extract were assessed using the well diffusion method.

Results: White tea extract demonstrated significant antimicrobial activity against both *Escherichia coli* and *Listeria monocytogenes*, with inhibition zones measuring 15±0.4 mm for *Escherichia coli*

and 18±0.6 mm for *Listeria monocytogenes*. The MIC and MBC for *Listeria monocytogenes* were found to be 6.5 mg/ml and 12.5 mg/ml, respectively, while for *Escherichia coli*, the values were 12.5 mg/ml and 25 mg/ml. The combination of white tea extract and *Lactobacillus casei* supernatant showed enhanced antimicrobial effects, with inhibition zones of 23±0.6 mm and 20±0.2 mm for *Escherichia coli* and *Listeria monocytogenes* respectively. These results indicate that the supernatant from *Lactobacillus casei* significantly increased the antimicrobial activity of the white tea extract.

Discussion: The findings of this study confirm the antimicrobial potential of white tea extract against both *Escherichia coli* and *Listeria monocytogenes*. White tea, rich in polyphenols such as catechins, contributes to the antimicrobial activity observed. The observed higher efficacy of white tea against *Listeria monocytogenes* compared to *Escherichia coli* may be attributed to the structural differences between Gram-positive and Gram-negative bacteria, with Gram-positive bacteria generally being more susceptible to plant-derived antimicrobial compounds. Furthermore, *Lactobacillus casei* supernatant enhanced the antimicrobial properties of white tea extract, likely due to the presence of additional antimicrobial substances such as bacteriocins, organic acids, and hydrogen peroxide, which synergistically work against pathogenic bacteria. This combination shows potential as a natural antimicrobial agent in food preservation, offering a promising alternative to traditional chemical preservatives.

Conclusion: This study demonstrates the significant antimicrobial effects of white tea extract and *Lactobacillus casei* supernatant against *Escherichia coli* and *Listeria monocytogenes*, with a pronounced synergistic effect when used in combination. The findings suggest that this combination could serve as a promising food additive to combat foodborne pathogens and prevent food spoilage. Further research into the broad-spectrum antimicrobial properties of this combination and its application in food products is recommended. This natural solution could play a crucial role in reducing the reliance on synthetic preservatives and combating antibiotic-resistant bacteria in the food industry.

Keywords: *Lactobacillus casei*, Antimicrobial properties, white tea, *Escherichia coli*, *Listeria monocytogenes*