

Antibacterial and Anti-Biofilm Activity of Vaccinium meridionale S. Pomace Extract Against Staphylococcus aureus, Escherichia coli and Salmonella Enterica

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Abstract : Bacterial biofilms cause an ongoing problem for food safety. They are formed when microorganisms aggregate to form a community that attaches to solid surfaces. Biofilms increase the resistance of pathogens to cleaning, disinfection and antibacterial products. This resistance gives rise to problems for human health, industry, and agriculture. At present, plant extracts rich in polyphenolics are being investigated as natural alternatives to degrade bacterial biofilms. The pomace of the tropical Berry Vaccinium meridionale S. contains high amounts of phenolic compounds. Therefore, in the current study, the antimicrobial and antibiofilm effects of extracts from the pomace of Vaccinium meridionale S. were tested on three foodborne pathogens: Enterohaemorrhagic Escherichia coli O157:H7 (ATCC®700728TM), Staphylococcus aureus subsp. aureus (ATCC®6538TM), and Salmonella enterica serovar Enteritidis (ATCC®13076TM). Microwave-assisted extraction was used to extract polyphenols with aqueous methanol (80% v/v) at a solid to solvent ratio of 1:10 (w/v) for 20 min. The magnetic stirring was set at 400 rpm, and the microwave power was adjusted to 400 W. The antimicrobial effect of the extract was assessed by determining the half maximal inhibitory concentration (IC50) against the three food poisoning pathogens at concentrations ranging from 50 to 2,850 µg gallic acid equivalents (GAE)/mL of the extract. Biofilm inhibition was assessed using a crystal violet assay applying the same range of concentration. Three replications of the experiments were carried out, and all analyses were run in triplicate. IC50 values were determined using the GraphPad Prism8® program. Significant differences ($P < 0.05$) among means were identified using one-factor analysis of variance (ANOVA) and the post-hoc least significant difference (LSD) test using the Statgraphics plus program, version 2.1. There was significant difference among the mean IC50 values for the tested bacteria. The IC50 for S. aureus was 48 ± 9 µg GAE/mL, followed by 123 ± 49 µg GAE/mL for Salmonella and 376 ± 32 µg GAE/mL for E. coli. The percent inhibition of the extract on biofilm formation was significantly higher for S. aureus (85.8 ± 0.3), followed by E. coli (74.5 ± 1.0) and Salmonella (53.6 ± 9.7). These findings suggest that polyphenolic extracts obtained from the pomace of V. meridionale S. might be used as natural antimicrobial and anti-biofilm natural agents, effective against S. aureus, E. coli and Salmonella enterica.

Keywords : antibiofilm, antimicrobial, E. coli, S. aureus, salmonella, IC50, pomace, V. meridionale

Conference Title : ICFSN 2024 : International Conference on Food Science and Nutrition

Conference Location : New York, United States

Conference Dates : July 11-12, 2024