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Evaluating ginger extract, wild blueberry extract, and polysorbates (PS20, PS80) on Pseudomonas aeruginosa biofilm formation

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Abstract
Introduction: Pseudomonas aeruginosa is a biofilm forming pathogen that challenges clinical and industrial settings. Many natural products and surfactants have been screened and valued for their anti-biofilm capacity. In this study we assessed the inhibitory effect and molecular mechanism of action of ginger extract (Zingiber officinale Rosc.), wild blueberry extract (Vaccinium angustifolium), and polysorbates (PS20/PS80) on biofilm formation.
Methodology: Ginger and wild blueberry extractions were done using ethanol and distilled water, respectively. Hexane and methanol were used for extracts’ liquid-liquid portioning. LC-HRMS was performed to obtain extract fractions. Efficacy of the crude extracts, fractions, and polysorbates was assessed on P. aeruginosa PAN14 growth and biofilm. Transcription levels of biofilm encoding genes ndvB, pelC, algC and quorum sensing genes lasI, lasR, rhlI, rhlR were evaluated by RT-qPCR.
Results: Extracts and polysorbates concentrations did not affect P. aeruginosa growth. Biofilm assay showed a reduction in biofilm when 5% ginger, 25% wild blueberry extracts, 0.2% PS20, and 0.25% PS80 were added. LC-HRMS analysis of ginger extract showed abundant gingerol in the hexane layer. Wild blueberry chromatograms showed various constituents differing between their peel and pulp, and pulp extracts. RT-qPCR showed decreased transcription levels of exopolysaccharide and quorum sensing genes with a 363.6 folds reduction in ndvB upon treatment with 25% wild blueberry peel and pulp extract.
Conclusion: These results shed light on the mechanism of action of ginger and wild blueberry constituents as well as PS20/80 on P. aeruginosa biofilm formation. Future mouse model experiments are useful to test biofilm inhibition in-vivo.

Key words: biofilm; ginger; blueberry; polysorbate; Pseudomonas.


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