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Poster 4

Targeting quorum sensing: ferulic and sinapic acids compromise *Pseudomonas aeruginosa* biofilm architecture and virulence

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Abstract

Background: *Pseudomonas aeruginosa* is a Gram-negative pathogenic bacterium that is frequently associated with chronic infections in immunocompromised individuals, such as those with cystic fibrosis or burns [1]. The pathogenicity and virulence of *P. aeruginosa* are primarily regulated by quorum sensing, with the *las* system playing a key role in this process. This system is essential for the formation and maintenance of the biofilm and for controlling various virulence factors [2]. Phenolic acids, such as ferulic and sinapic acids, are plant secondary metabolites, well known for their biological properties and have shown promise in modulating bacterial communication [3]. **Objective:** The aim of this study was to evaluate the potential of ferulic and sinapic acids to inhibit the *P. aeruginosa las* QS system and its underlying effects on biofilm structure and virulence factor production. **Methods:** The inhibitory effect on the *las* system was evaluated using bioreporter strains and bioluminescence-based assays. Biofilm architecture was analyzed using optical coherence tomography, while virulence factors (pyoverdine, pyocyanin, total proteases, lipases, gelatinases and siderophores) production and motility were investigated by absorbance measurement and plate agar method. **Results:** Ferulic and sinapic acids inhibited *las* QS activity by 90 % at a concentration of 1000 µg mL^{-1}. The N-3-oxododecanoyl-homoserine lactone production was reduced by 70 % at just 6.25 µg mL^{-1} of the phenolic acids. These compounds significantly changed biofilm architecture, reducing biofilm thickness from 25 µm to 9 µm. They also reduced the production of key virulence factors and impaired swarming motility. **Conclusion:** Ferulic and sinapic acids demonstrated strong inhibitory effects on the *las* QS system, leading to altered biofilm structure and reduced virulence. These findings support their potential as antipathogenic and antivirulence agents for prevention/treatment of *P. aeruginosa* biofilm-associated infections.

Keywords: biofilm architecture; quorum-sensing; *Pseudomonas aeruginosa*

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